ABSTRACT BOOK
ICONBUILD - RCCE 2019

4th INTERNATIONAL CONFERENCE ON CONSTRUCTION AND BUILDING ENGINEERING & 12th REGIONAL CONFERENCE IN CIVIL ENGINEERING

Regional Conference in Civil Engineering
<table>
<thead>
<tr>
<th>ID</th>
<th>PAPER TITLE</th>
<th>AUTHORS</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>005-003</td>
<td>Cyclic Behaviour of Beam-Column Joints with Corbels under In-Plane Lateral Loads</td>
<td>Kay Dora A.G., Hamid N.H., Rozli M.I.F. Che Nooryohana Z.</td>
<td>1</td>
</tr>
<tr>
<td>007-005</td>
<td>Feasibility Study on Potential of Pedestrians’ Footstep Based Energy Harvesting (Case Study: Uitm Pulau Pinang)</td>
<td>Noorul Iqilhima Najwa Ismail, Nurul Aishah Abd Rahman; Noor Safwan Muhamad; Ahmad Amzari Yaccob; Siti Umrah Jamaladin</td>
<td>2</td>
</tr>
<tr>
<td>008-007</td>
<td>Time-Dependent Rheological Behavior of Cement-Sand Injection Grout Containing High Volume Fly Ash</td>
<td>B Balakrishnan, N H A Khalid M Ismail</td>
<td>3</td>
</tr>
<tr>
<td>007-008</td>
<td>Pedestrian’s Perception toward Quality of Sidewalk Facilities Case Study: Uitm Pulau Pinang</td>
<td>Noorul Iqilhima Najwa Ismail, Nurul Aishah Abd Rahman; Noor Safwan Muhamad, Ahmad Amzari Yaccob, Nor Haslina Mohtar</td>
<td>4</td>
</tr>
<tr>
<td>010-010</td>
<td>Eggshell as the Partial Replacement of Portland Cement in the Production of Concrete</td>
<td>Mohd Yunus Ishak and Muhammad Nazrif Zamani</td>
<td>5</td>
</tr>
<tr>
<td>004-012</td>
<td>Effect of mismanagement towards abandoned project in Malaysia</td>
<td>S A Salam, N F Ariffin, N F N Mohamad Noor, M I Ali and N I Ramli</td>
<td>5</td>
</tr>
<tr>
<td>013-016</td>
<td>Structural Health Monitoring of Prestressed Concrete Beams by Vibration- and Impedance-based Smart Technologies</td>
<td>Duc-Duy Ho and Thanh-Cao Le</td>
<td>6</td>
</tr>
<tr>
<td>015-017</td>
<td>Local effect of column flange flexibility on shear lag in steel box moment connections</td>
<td>P Doung and E Sasaki</td>
<td>7</td>
</tr>
<tr>
<td>016-018</td>
<td>Eco-efficient concrete containing recycled ceramic wastes aggregate</td>
<td>P M Dalmon, A Z Awang, A R M Sam, M C Khun and P Loo</td>
<td>7</td>
</tr>
<tr>
<td>017-019</td>
<td>Social aspect implementation in sustainable construction</td>
<td>Tantish Kamaruddin, Assoc Prof Dr Razali Adul Hamid and Syaheerah Abd Ghani</td>
<td>8</td>
</tr>
<tr>
<td>022-022</td>
<td>Critical Green Road Criteria for Malaysia Green Rural Road Index</td>
<td>M H S Abd Rashid, R Zakaria, E Aminudin, J A Adzar, S M Shamsuddin, V Munikanan, N E Alias, S Z Sooria, K M Saha</td>
<td>9</td>
</tr>
<tr>
<td>021-023</td>
<td>Hardened properties of concrete with different proportion of crumb rubber and fly ash</td>
<td>A M Najmi, A K Mariyana, P N Shek and Z Nurizaty</td>
<td>10</td>
</tr>
<tr>
<td>023-024</td>
<td>Awareness of Adopting Building Information Modelling –Consultants Case in West Sumatra</td>
<td>Z Sriyolja, N. Harwin , K Yahya</td>
<td>11</td>
</tr>
<tr>
<td>012-025</td>
<td>The Experimental studies of punching shear behaviour of reinforced concrete flat slab with the inclusion of steel fibre: Overview</td>
<td>N F Zamri, R N Mohamed, D Awalluddin</td>
<td>11</td>
</tr>
<tr>
<td>No</td>
<td>Title</td>
<td>Authors</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>026-028</td>
<td>Sustainable use of Laterite Soil as Compressed Cement Stabilized Earth Block for Low Cost Housing Construction</td>
<td>Nurul Ain Ibrahim, Thamendran Magindran, Muhammad Irfan Shahrin, Nur ‘Ain Mat Yusof</td>
<td></td>
</tr>
<tr>
<td>002-029</td>
<td>Identifying of project manager competence factors in managing EPC projects in Indonesia</td>
<td>Mairizal, Edrizal, Mohd Ismail, Rosli Mohamad Zin</td>
<td></td>
</tr>
<tr>
<td>014-032</td>
<td>Critical project manager competencies in managing highway projects in West Sumatera – Indonesia</td>
<td>Edrizal, Mairizal, Muhd Zaimi Abd Majid, Rosli Mohamad Zin</td>
<td></td>
</tr>
<tr>
<td>030-033</td>
<td>Effect of high temperatures on physical and compressive strength properties of self-compacting concrete incorporating palm oil fuel ash</td>
<td>Kasali A Mujedu, Mariyana A Ab Kadir, Mohammad Ismail</td>
<td></td>
</tr>
<tr>
<td>028-034</td>
<td>Flexural strength improvement for structural glass: a numerical study</td>
<td>R Hin, K Cheng, V Han, F Bernard, C Seang, V Keryvin, J-C Sanglebeuf</td>
<td></td>
</tr>
<tr>
<td>031-035</td>
<td>Critical Risk Factor Affecting Project Performance In West Sumatera</td>
<td>D. Kurniawan, Masril, and A. Rahman</td>
<td></td>
</tr>
<tr>
<td>032-036</td>
<td>Building Safety Indeks for Elementary School Building In West Sumatera</td>
<td>Masril, Deddy Kurniawan and Moh. Ismail</td>
<td></td>
</tr>
<tr>
<td>034-038</td>
<td>Tensile and Shear Strength of Four Species of Bamboo in Malaysia</td>
<td>Dinie Awalluddin, Mohd Azreen, Mohd Arifin, Yusof Ahmad, Nor Fazlin Zamri, Izn Syahrazal Ibrahim, Mohd Hanim Osman, and Han-Seung Lee</td>
<td></td>
</tr>
<tr>
<td>035-039</td>
<td>A review on sources of carbon emission for airport</td>
<td>Rahmat Aliiffardi, Muhd Zaimi Abd. Majid, Prima Zola</td>
<td></td>
</tr>
<tr>
<td>037-040</td>
<td>Analysis of Moisture Susceptibility of Hot Mix Asphalt (HMA) with Waterproofing Additives</td>
<td>Adelia Dwidaruma Nataadmajda, Eduardi Prahara, Oki Setyandito, Risma Winna Ananditha</td>
<td></td>
</tr>
<tr>
<td>038-043</td>
<td>Prioritization of identified environmental loss factor subject to offshore structure failures based on public perception</td>
<td>Ahmad Salehudin, N.S., Zardasti, L., Noor, M.N., Abd. Khalid, N.F</td>
<td></td>
</tr>
<tr>
<td>025-044</td>
<td>A Review on Coating Materials as Thermal Insulation</td>
<td>Dg Normaswanna Tawasil, Eeydzah Aminuddin, Hasanah Abdul Shukor Lim, Rozana Zakaria, Leng Pau Chung and Liew Wai Loan</td>
<td></td>
</tr>
<tr>
<td>029-046</td>
<td>Extraction and Analysis of Construction Safety Hazard Factors from Open Data</td>
<td>N K A H Rupasinghe and K Panuwatwanich</td>
<td></td>
</tr>
<tr>
<td>044-049</td>
<td>Introducing Effective microorganism (EM) as Self-curing Agent in Self-cured Concrete</td>
<td>R P Memon, A R M Sam, A Z Awang, M M Tahir, A Mohamed, K A Kassim and A Ismail</td>
<td></td>
</tr>
<tr>
<td>019-052</td>
<td>Precast connection behaviour using finite element</td>
<td>M F Ishak and N F Hashim</td>
<td></td>
</tr>
<tr>
<td>047-053</td>
<td>Green Artificial Aggregates as Self-Curing Agent in Concrete</td>
<td>N Hamzah, H Mohd Saman, A R Mohd Sam, M N Muhd Sidek, P Loo, S A Abd Latif</td>
<td></td>
</tr>
<tr>
<td>048-054</td>
<td>Influence of Steel Fiber Shapes on Fresh and Hardened Properties of Steel Fiber Reinforcement Self-Compacting Concrete (SFRSCC)</td>
<td>Faiz Sulthan</td>
<td></td>
</tr>
<tr>
<td>050-055</td>
<td>Critical Success Factors on the Implementation of Industrialized Building System in West Sumatra</td>
<td>Alzahr, Rosli Mohammad Zin, Indra Farni, Mairizal Zainuddin, Edrizal</td>
<td></td>
</tr>
<tr>
<td>051-056</td>
<td>Slope Stability Analysis along the Road between Yinnabin and Kalaw in Mandalay Region and Shan State, Myanmar</td>
<td>Aung Kyaw Myat, Day Wa Aung, Tun Naing Zaw and Hlaing Myo Nwe</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>Title</td>
<td>Authors</td>
<td>Authors</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>052-057</td>
<td>The Importance of Contractors’ Performance Appraisal System for Biophilic City Development in Malaysia</td>
<td>Khairul Zahreen Mohd Arof, Syuhaida Ismail, Abd Latif Saleh</td>
<td>25</td>
</tr>
<tr>
<td>011-058</td>
<td>Influence of Rust Removal Process on the Effectiveness of Sacrificial Anode Cathodic Protection in Repair Concrete</td>
<td>P Astuti, K. Kamarulzaman, R S Rafidina, H Hamada, Y Sagawa, and D Yamamoto</td>
<td>26</td>
</tr>
<tr>
<td>053-059</td>
<td>Structural Damage Localization and Evaluation of the Reinforced Concrete Frame Structure by Acoustic Emission Technique</td>
<td>N. Muhamad Bunnori, Alireza Panjetooni</td>
<td>27</td>
</tr>
<tr>
<td>055-061</td>
<td>Improving Strength of Porous Asphalt: A Nano Material Experimental Approach</td>
<td>Rani Pradoto, Eliza Puri, Tri Hadinata, and Qintha D. Rahman</td>
<td>28</td>
</tr>
<tr>
<td>058-062</td>
<td>Evaluation of Crop Water Requirements for Yazagyo Irrigated Area, Myanmar</td>
<td>Mar Lar Myint</td>
<td>29</td>
</tr>
<tr>
<td>059-063</td>
<td>Specification for Torsional Bracing Design of Steel I Girder Simple Span Bridges during Construction Stage</td>
<td>T N Huynh, R A Nguyen, D M Pham, T L T Pham and K T Nguyen</td>
<td>29</td>
</tr>
<tr>
<td>039-065</td>
<td>Alkali-Activated Binder as Stabilizer in Compressed Earth Blocks</td>
<td>Jason Ongpeng, Emerson Gapuz, Jester Joseph San Andres, Darlene Prudencio, James Cuadllisan, Mark Tadina, Arnold Zacarias, Dannah Benauro, Alyanna Pabustan</td>
<td>30</td>
</tr>
<tr>
<td>057-066</td>
<td>Load Distribution Characteristic of Road Base Layer under a Static Surface Loading</td>
<td>Grawira Ganjur Giwangkara, Azman Mohamed, Nur Hafizah A. Khalid, Hasanan Md. Nor, Izwan Shah bin Ahmad</td>
<td>31</td>
</tr>
<tr>
<td>060-068</td>
<td>Issues and Challenges in the Implementation of Public Housing Redevelopment Projects Due to Earthquake</td>
<td>Indra Farni, Rosli Mohamad Zin, and Alzahri</td>
<td>32</td>
</tr>
<tr>
<td>060-069</td>
<td>Community Based Approach in the Implementation of Rehabilitation and Reconstruction Project After Earthquake in West Sumatera</td>
<td>Indra Farni, Rosli Mohamad Zin, and Alzahri</td>
<td>33</td>
</tr>
<tr>
<td>063-071</td>
<td>Flexural Strength of Concrete on Different Water-Cement Ratio and Notches</td>
<td>Mohamad Shazwan Ahmad Shah, Norhazilan Md. Noor, Ahmad Beng Hong Kueh and Mohd. Nasir Tamin</td>
<td>33</td>
</tr>
<tr>
<td>067-072</td>
<td>Application of Circular Economy in the Indonesia Construction Industry</td>
<td>Tri Joko Wahyu Adi, Panji Wibowo</td>
<td>34</td>
</tr>
<tr>
<td>068-073</td>
<td>Technology Assessment in Indonesian Construction Industry</td>
<td>B W Soemardi, B Kusuma, and M Abduh</td>
<td>35</td>
</tr>
<tr>
<td>071-075</td>
<td>Effect of Unground Palm Oil Fuel Ash as Partial Sand Replacement on Compressive Strength of Oil Palm Shell Lightweight Concrete</td>
<td>Saffuan Wan Ahmad, Khairunisa Muthusamy, Mohd Hanafi Hashim, Ahmed Mokhtar Alibshir Budiea, Nur Farhayu Ariffin</td>
<td>36</td>
</tr>
<tr>
<td>Paper Number</td>
<td>Title</td>
<td>Authors</td>
<td>Pages</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>072-076</td>
<td>Stabilisation of Sohar’s Sabkha Soil using Waste Gypsum Plasterboard</td>
<td>Hilal S. Al-Alawi, Abideen A. Ganiyu, and Atef Badr</td>
<td>37</td>
</tr>
<tr>
<td>077-079</td>
<td>The Influence of Palm Oil Fuel Ash on the Fresh Properties of Green Self-Compacting Concrete</td>
<td>S. H. Abo Sabah, Z. Zainul, S. F. Hashim, M. A. Megat Johari</td>
<td>38</td>
</tr>
<tr>
<td>079-080</td>
<td>Influence of Epoxy Resin without Hardener On the Microstructure of Mortar</td>
<td>Nur Farhuyu Ariffin, Nor Hasanan, Abdul Shukor Lim, Sharifah Maszura Syed Molsin, Mohd Warid Hussin, Abdul Rahman Mohd Sam</td>
<td>38</td>
</tr>
<tr>
<td>086-083</td>
<td>Screening of Native Ureolytic Bacteria for Self-Healing in Cementitious Materials</td>
<td>Hassan Amer Algaifi, Abdul Rahman Mohd Sam, Shuhaimi Abu Bakar and Ahmad Razin Zainal Abidin</td>
<td>39</td>
</tr>
<tr>
<td>042-084</td>
<td>Flexural Performance of Cold-Formed Steel Section in a Composite Beam System</td>
<td>M M Lawan, S P Ngian, and M M Tahir</td>
<td>40</td>
</tr>
<tr>
<td>090-085</td>
<td>Observation of Temporary Accommodation for Construction Workers According to Code of Practice for Temporary Construction Site Workers Amenities and Accommodation (MS2593:2015) in Johor, Malaysia</td>
<td>Siti Khalijiah Yaman, Norasyikin Khamis, Hairuddin Mohammad, Azeanita Suratkon, Syed Burhanuddin Syed Hilmi, and Hasniza Abu Bakar</td>
<td>40</td>
</tr>
<tr>
<td>091-086</td>
<td>Experimental Study on Composite Connection with Double Lipped C-Sections</td>
<td>Muhammad Firdaus, Anis Saggaff, Mahmood Md Tahir, Shek Poi Ngian, Tan Cher Siang, K M Aminuddin and Musab Nimir Ali Salih</td>
<td>41</td>
</tr>
<tr>
<td>091-087</td>
<td>Behaviour of Rectangular Gusset Plate with Angle Cleat Connections for Cold-Formed Steel Section</td>
<td>KM Aminuddin, Anis Saggaff, Mahmood Md Tahir, Shek Poi Ngian, Arizu Sulaiman, Muhammad Firdaus, Musab N A Salih</td>
<td>42</td>
</tr>
<tr>
<td>091-088</td>
<td>Flexural Behaviour of Interlocking Brick System with GROUT Cement Mixed with Various Fibre</td>
<td>A M A Muizz, M T Mahmood, P N Shek, A S L Norhasanah, M R Khan, T S Asiah</td>
<td>43</td>
</tr>
<tr>
<td>091-089</td>
<td>Behaviour of Composite Beam Arranged as Boxed-Section with C-Channel of Cold-Formed Steel of Lipped Section</td>
<td>Khadavi, M.M Tahir, Musab N A Salih, Abraham Ahmad S A and P N Shek</td>
<td>44</td>
</tr>
<tr>
<td>072-090</td>
<td>Impact of Corroded Bars and Spalling on the Bond Strength of Reinforced Concrete Structures</td>
<td>Wasiu O Ajagbe, Abideen A Ganiyu, Chike Okoloekwue and Hilal S Al-Alawi</td>
<td>44</td>
</tr>
<tr>
<td>073-092</td>
<td>Building Condition Assessment (BCA) on school building in Sabah, Malaysia</td>
<td>Syahirah Mohd Noor, Hazel Kiddo Richard, Izni Syahrizal Ibrahim, Noor Nabilah Sarbini, Lee Hanseung and Jitendra Kumar</td>
<td>46</td>
</tr>
<tr>
<td>093-093</td>
<td>Corrosion Study of Pipeline Material for Seabed Sediment in Tropical Climate</td>
<td>A M A Budiea, N Yahaya, N M Noor, A H Abdullah, M H W Ibrahim, A Suratkon, K Muthusamy</td>
<td>47</td>
</tr>
<tr>
<td>092-094</td>
<td>Thermal Comfort Study for School Classroom</td>
<td>Ain Naadia Mazlan, Syazwan Saad, Khairulzun Yahya, Zaiton Haron, Dayang Zulaika Abang Hasbollah, Erwan Hafizi Kasiman, Noorlizawati Abd Rahim, Aion Muhamed Salehuddin</td>
<td>47</td>
</tr>
<tr>
<td>094-095</td>
<td>RISBARI: An Alternative House Model for the 2018 Lombok Earthquake Affected People</td>
<td>A Awaludina, Y Adiyuanob and F A Mursyidc</td>
<td>48</td>
</tr>
<tr>
<td>095-096</td>
<td>The perception and Challenges of Construction Stakeholder towards Emissions Reduction in Malaysia</td>
<td>N K Mustaffa and C M Mat Isa</td>
<td>49</td>
</tr>
<tr>
<td>Abstract ID</td>
<td>Title</td>
<td>Authors</td>
<td>Pages</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>085-097</td>
<td>Investigating the utilization of coal fly ash in the adsorptive removal of fluoride from contaminated water</td>
<td>L M S D Pitawala, H M P Wijeyawardana and K G N Nanayakkara</td>
<td>49</td>
</tr>
<tr>
<td>097-099</td>
<td>Contractor’s Understanding towards the Implementation of Quality Assessment System in construction (QLASSIC) in Construction Industry</td>
<td>Zailawati Khalid and Sitti Diana Tamjehi</td>
<td>50</td>
</tr>
<tr>
<td>098-100</td>
<td>Performance of Concrete Incorporating High Volume Coal Waste</td>
<td>Nor Hasanah Abdul Shukor Lim, Tan Shea Qin, Nur Farhayu Ariffin, Hamidun Mohd Noh, Mohd Warid Hussin</td>
<td>51</td>
</tr>
<tr>
<td>027-102</td>
<td>Project Manager’s Skills Framework (PMSF) for improving the performance of complex projects in Kuwait Construction Industry</td>
<td>Faisal Alshammari, Khairulzan Yahya, and Zaiton Binti Haron</td>
<td>51</td>
</tr>
<tr>
<td>100-103</td>
<td>Combined Field Data and Wave Refraction Modelling for Development of a Predictive Closure Depth Equation</td>
<td>MS Ab Razak and AR Khan</td>
<td>52</td>
</tr>
<tr>
<td>101-104</td>
<td>Conceptual Framework on Noise Ranking Classification in Eatery Places for Human Psycho-Acoustics Preferences and Design Strategy towards Acoustic Comfort</td>
<td>Nazli Che Din, Noor Aini Mistar, Raha Sulaiman, Zunaibi Abdullah, Musli Nizam Yahya and Zaiton Haron</td>
<td>53</td>
</tr>
<tr>
<td>088-106</td>
<td>On the Corruption in Public Infrastructure Procurement in Indonesia - A Literature Review</td>
<td>Dewi Yustiarini, Biemo W. Soemardi</td>
<td>55</td>
</tr>
<tr>
<td>099-107</td>
<td>Effectiveness of Crumb Rubber for Subgrade Soil Stabilization</td>
<td>Juliana, A R Fatin, R Rozaini, M N Masyitah, A H Khairul and A Nur Shafieza</td>
<td>55</td>
</tr>
<tr>
<td>062-109</td>
<td>Mapping of construction waste for eco-costs per value ratio (EVR) index using Google My Maps in Shah Alam, Malaysia</td>
<td>Sharan Kumar Arumugam, Rahimah Muhmad, Khairulzan Yahya</td>
<td>57</td>
</tr>
<tr>
<td>017-110</td>
<td>A Situational Study on Sustainable Housing Features in Johor</td>
<td>Razali Adul Hamid, Tantish Kamaruddin and Nur Amalia Syazwani binti Rohaizam</td>
<td>57</td>
</tr>
<tr>
<td>003-112</td>
<td>The Impact of Green Behavior Capability on Green Construction Performance with Environmental Orientation Optimization as a Moderate Variable: An Empirical Study on Construction in Indonesia</td>
<td>Ram Ariff, Khairulzan Yahya, Safian Sharif</td>
<td>58</td>
</tr>
<tr>
<td>003-113</td>
<td>Green Construction Capability for Environmental Sustainability Performance: An Empirical Study on Construction Sector in Indonesia</td>
<td>Ram Ariff, Safian Sharif, Khairulzan Yahya</td>
<td>59</td>
</tr>
<tr>
<td>Paper No.</td>
<td>Title</td>
<td>Authors</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>104-115</td>
<td>Occupational safety and health in construction industry management (OSHCIM) implementation – Academician’s perspectives</td>
<td>Hamizah Liyana Tajul Ariffin, Norhazren Izatie Mohd, Nurshikin Mohamad Shukery, Lim Carmen, Kamarizan Kidam, Mohamad Ismail, Kherun Nita Binti Ali, Nur Emma Mustaffa, Jafri Mohd Rohani, Noor Nabilah Sabrini, Samsiah Abdullah, Hamidah Kamardeen, Siti Suhaili Shalhan, Hanafiah Kamarden, Nur Kamila Abd Jalil, Muhammad Yusuf Nordin, Nazruddin bin Mat Ali and Muhammad Syaiful Ahdat M Fetri</td>
<td></td>
</tr>
<tr>
<td>106-118</td>
<td>Risk Factors Associated with the Outsourcing of Urban Facilities Management</td>
<td>Mainunah Sapri, Kong Guang Wen, Hishamuddin Mohd Ali, Masitah Muhibudin</td>
<td></td>
</tr>
<tr>
<td>102-119</td>
<td>Obstacles of revenue diversification in public higher education institution</td>
<td>Rohaya Abdul Jalil, Hishamuddin Mohd Ali, and Nor Fatimah Abd Hamid</td>
<td></td>
</tr>
<tr>
<td>064-121</td>
<td>Challenges of implementing green procurement in public construction projects in Malaysia</td>
<td>Ahmed Alqadami, Noor Amila Zawawi, Yani Rahmawati and Wesam Alaloul</td>
<td></td>
</tr>
<tr>
<td>109-123</td>
<td>Perceptions of Potential Home Buyers on Smart Home Concept</td>
<td>A H Hariati, Z A Rasyidah, M Rosadah and M R Maryanti</td>
<td></td>
</tr>
<tr>
<td>092-125</td>
<td>Process of Construction Procurement in Industrialised Building System</td>
<td>Nurulhuda Ahamad, Ain Naadia Mazlan, Rosli Mohamad Zin and Siti Asiah Tukirin</td>
<td></td>
</tr>
<tr>
<td>114-129</td>
<td>Rubber Damping System of Industrialised Building System (IBS) Block Work House</td>
<td>S C Lee and C K Ma</td>
<td></td>
</tr>
<tr>
<td>116-130</td>
<td>A Study on Integration of Building Information Modeling (BIM) in Civil Engineering Curricular</td>
<td>N E Kordi, N I Zainuddin, N F Taruddin, and T N A Tengku Aziz</td>
<td></td>
</tr>
<tr>
<td>117-131</td>
<td>Evaluation of Speed Distribution at Horizontal Alignment on Two-Lane Rural Arterial Highway Under Mesopic and Photopic Scenario</td>
<td>Rino Effendy, Muhammad Akram Adnan, Norlina Sulaiman, Mohd Azuan Tukiar and Nor Izzah Zainuddin</td>
<td></td>
</tr>
<tr>
<td>Session</td>
<td>Title</td>
<td>Authors</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>121-132</td>
<td>The benefits of implementation of BIM technologies and tools in significantly construction wastes in the Malaysia construction Industry</td>
<td>Gunalaan Vasudevan</td>
<td>69</td>
</tr>
<tr>
<td>091-135</td>
<td>Factors Affecting the Delay in Construction at Mentawai Island, Indonesia</td>
<td>E. Elfi, M T Mahmood and T S Asiah</td>
<td>69</td>
</tr>
<tr>
<td>125-136</td>
<td>Determination of Water Consumption Behavioural Pattern of Student Resident at Public University: Universiti Teknologi Malaysia</td>
<td>S Z Daud, I Sipan, H M Ali, H A Hashim and M H Ishak</td>
<td>70</td>
</tr>
<tr>
<td>126-137</td>
<td>Classroom illuminance: a case in Malaysian university</td>
<td>Zuraidah Mat Seman, Low Sheau-Ting, Razlin Mansor, Wee Siaw-Chui and Siti Zulfarina</td>
<td>71</td>
</tr>
<tr>
<td>127-138</td>
<td>The Effects of Seaweed Powder to the Properties of Polymer Modified Concrete</td>
<td>Noor Nabilah Sarbini, Izni Syahrizal Ibrahim, Mohammad Ismail and Muhd Zubair Tajol Anuar</td>
<td>71</td>
</tr>
<tr>
<td>129-139</td>
<td>Review On The Application Of Optical Fibre Sensing In Slope Monitoring</td>
<td>Izwan Shah Ahmad, Azman Kassim and Hisham Mohamad</td>
<td>72</td>
</tr>
<tr>
<td>128-140</td>
<td>Effects of crumbed para rubber on permanent deformation resistance of hot mix asphalt</td>
<td>Hatthaphone Silimanotham and Boonchai Sangpetgnam</td>
<td>72</td>
</tr>
</tbody>
</table>
Cyclic Behaviour of Beam-Column Joints with Corbels under In-Plane Lateral Loads

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Three full-scale sub-assemblages of corner, exterior and interior precast beam-column joints with corbel were designed using BS8110 Code of Practice. These three specimens were constructed and tested in a heavy structural laboratory under in-plane lateral cyclic loading. The corner, exterior and interior beam-column joints were tested starting from ±0.01% until 1.35% drift, ±1.00% drift and ±1.15% drift, respectively. This study found that the existence of corbels in precast joints can delay the yielding of the top reinforcement bars and increase the stiffness of the joint. However, the experimental result has proved that the corbel for corner beam-column joint was the weakest point of the joint based on the crack damaged at the corbel. On the other hand, the experimental work found that precast beam-column corner joint specimen exhibited 21.5% more ductile behaviour as compared to other two specimens. However, the ductility values for all specimens were recorded at less than 3, indicating that precast beam-column joint specimens were not able to take moderate to strong earthquake excitation.

Keywords: beam column-joint; corbels; hysteresis loops; ductility; stiffness; precast buildings
This paper presents computation of Dead-End System for Water Reticulation using Excel Spreadsheet. An on-going project entitled Regional Operations Center (ROC) located in Melaka, Malaysia was taken as a case study for this study in which all the information needed such as water demand, tapping pressure and location were referred. In the author’s Host Company, a great amount of time (approximately 5 hours) had been taken in performing Dead-End analysis. Furthermore, the computation of design by the engineers is a tedious process as the previous spreadsheet contains wrong and insufficient information. With that, this study is aimed to design a Dead-End System Calculation which can compute the necessary information needed in Water Reticulation. As well, the study aims to verify the accuracy of the above said calculation spreadsheet by using EPANET which is a modelling tool for drinking water distribution. The author first designed the calculation spreadsheet using preliminary information from ROC. Then, the author computed the exact same design by using EPANET. Next, the author made comparison of results taken from both methods. Lastly, the author did a comparison on time taken to compute water reticulation design between the previous available spreadsheet and the calculation spreadsheet designed by author. The verified calculation spreadsheet will allow users to get hydraulic information such as velocity, optimum pipe size, residual pressure and total head loss.

Keywords: Dead-End system, Water reticulation, EPANET.

Feasibility Study on Potential of Pedestrians’ Footstep Based Energy Harvesting (Case Study: UiTM Pulau Pinang)

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Rapid growth in population influences the demands towards electricity supply. The increasing growth in population is also a solution to this concern. People can also contribute to generate electricity through energy-based released activities such as walking. Walking is an example of human activities that may do every day. When a person walks, the energy may lose to the surface in form of impact and vibration. This energy will be tapped and will convert to electrical energy. Therefore, the feasibility study on potential pedestrians’ footstep based energy harvesting can be analyzed. UiTM Pulau Pinang has been selected as a case study because by doing in UiTM Pulau Pinang it can be seen clearly the percentage of successful of the study. Sidewalk in UiTM Pulau Pinang has the potential to be a basic medium for the study. To achieve the desired objectives, there are several methods of obtaining information. The first is by using the site observation and measurement site. Here, the author needs to make observations and measurements at each zone. Moreover, the author is distributes the questionnaire to the community in UiTM Pulau Pinang as a secondary data. From the questionnaire provided, the data on the frequency of use of the sidewalk according to each zone can be obtained. Distribution according to zones is done to simplify the process of collecting data. After data from both method used is obtained, the potential of footstep based energy harvesting can be analyzed.

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Calibration of rock Brazilian Test using Discrete Element Method in LS-DYNA

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Brazilian test which also known as indirect tensile test is widely used to evaluate the tensile strength of rock. Discrete element method (DEM) together with finite element method (FEM) approach was used to investigate numerically the response of granite material under Brazilian test for indirect measurement of tensile strength of rocks. The calibration analysis performed in this study using the commercial software LS-DYNA. It has been attempted to calibrate the micro-parameters in bonded particle model of granite rock for numerical modelling. In hybrid DEM-FEM simulation, the rock specimen was modelled in DEM while the steel plates were simulated using FEM. This numerical analysis is compared to experimental data of Brazilian test. It shows that the combination of numerical methods simulation could reproduce the trends of experimentally observed stress-strain curve of granite rock under tensile loading. Besides that, the hybrid DEM-FEM simulation also shows the same failure mode of granite specimen. Comparison between experimental data and numerical analyses is presented and discussed.

Keywords: Calibration, Discrete element method, Granite rock, LS-DYNA, Brazilian test.

Time-Dependent Rheological Behavior of Cement-Sand Injection Grout Containing High Volume Fly Ash

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Grouting technology is playing an increasingly important role in construction engineering. Various types of grout are available but cement slurry grouts are often selected for injection works due to better workability. Meanwhile, in repair works, cement-sand grout often preferred as the fine aggregates gives better volume stability for large repair area. However, theoretical research on the use of waste material to improve the rheological properties of cement-sand grout is still lacking. For grouts, rheology is a factor of prime importance to the transport, injection and pumping of the material. Cement-sand grouts often have poorer fluidity due to friction created by the sand. Since grouts typically contain cement, therefore fly ash can be a good option to improve the workability of the grout. This paper studies time dependent behaviour of the grout by measuring the flow times and viscosity of cement-sand grout containing high volume fly up (HVFA) to 1 hour from the time of mixing. The result indicates that replacement of HVFA reduces the flow time of the grout and maintained good fluidity up to 1 hour. The viscosity test showed that the grouts, at fresh state, behaved like a Bingham fluid by exhibiting lower viscosities for the mixtures containing fly ash at 0, 60 and 120 minutes. In conclusion, the use of large quantities of fly ash in grouts significantly enhances fluidity of the cement-sand grouts. Methodology comparison also resulted in new knowledge for best method flow test for fly ash grout.

Keywords: Grout; high volume fly ash; rheology; sustainability.

Pedestrian’s Perception toward Quality of Sidewalk Facilities
Case Study: UiTm Pulau Pinang

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This paper is to study the quality of sidewalk facilities. In order to promote sustainable mobilization through public transportation, a good quality of sidewalk facilities is actually should be first been reviewed. The pedestrian sidewalk is very important to be improved. A quality sidewalk is a basic infrastructure in order to encourage public to choose public transports as their main medium of mobilization. Questionnaire survey are applied as to assess the critical dimension of current pedestrian facilities and to analyze the pedestrian perception of sidewalk quality. UiTM Pulau Pinang campus been selected as case study. The method uses in this study are qualitative and quantitative method. Qualitative method refer to observation and taking picture on the study area, meanwhile quantitative method refers to questionnaire survey distributed to 100 respondents including students, admin staffs and also lecturers. All the collected data have been analyzed by using Statistical Package for Social Science (SPSS). The result indicates that, there are 3 factor of dimension and 13 items are significant for this study area. The dimensions are Physical Facilities, Accessibility and Safety. From these 3 dimensions, the most critical dimension is Physical Facilities. Therefore, the most dissatisfaction dimension by the respondents is Physical Facilities with the gap value is -19.070. Based on the final research findings through both methods, it is found that the existing sidewalks are not in good quality. There are
recommendations based on the 3 factors, which is provide the roof protection from bad weather along the sidewalk in UiTM Pulau Pinang campus, needs to increase the levels of pedestrian accessibility for sidewalk and ramps and lastly needs to provide more street lamp that in good condition along the sidewalk and more separate the sidewalk from vehicle.

Keywords: Sidewalk, Quality of sidewalk facilities, Pedestrian’s perception, Critical dimension

Eggshell as the Partial Replacement of Portland Cement in the Production of Concrete

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The population rate in Malaysia is increasing thus contributing to more undesirable wastes pollute the environment and the development in Malaysia flourishes rapidly. Consequently, the requirement of concrete is escalating thus maximizing the production of Portland cement. Such production liberates more carbon dioxide and causes air pollution. This study investigates the use of poultry waste in concrete production by replacing eggshell powder with Portland cement. Eggshell is identified rich in calcium similar to what cement has as it mainly contains 93.70% calcium carbonate (CaCO₃). Chicken eggshells are collected, cleaned, dried, grinded and sieved until the desired 90 µm size. 4 different batches are prepared by substituting 10-30% of eggshell powder with Portland cement in order to determine the suitability of eggshell powder as the partial replacement by investigating both workability and mechanical properties of eggshell blended batches via slump test and 3 destructive tests respectively. Consequently, the workability experiences reduction in the range of 30-70% whereas the results of all 3 destructive tests decrease in the range of 13-48% as the amount of eggshell powder increases. To conclude, eggshell powder is unsuitable for projects that require high strength concrete but may be suitable for projects that require less strength concrete.

Keywords: Eggshell powder, Portland cement, workability, compressive strength, split tensile strength, beam flexural

Effect of mismanagement towards abandoned project in Malaysia

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Over the years, Malaysian government has placed significant emphasis on the need for citizens to have their own house. Unfortunately, the abandoned housing projects are indeed a major hiccup for purchasers who dreams to have their own home become reality. The abandonment of housing projects has resulted in many adverse consequences to the economy, society and environment. Therefore, this study was conducted to identify the effects of mismanagement in contribution to the abandoned housing project. Together, the suitable solutions to mitigate the abandonment issues will also be proposed. The studies will focus on collecting the data form local authorities and also by doing a questionnaire. Later, the data will analyse based on the Likert’s scale and using relative of important index. The outcome of this research will contribute to the body of knowledge in term of the information regarding abandoned housing project to the involves parties especially developer and contractor.

Keywords: abandoned housing project, mismanagement, solution

Structural Health Monitoring of Prestressed Concrete Beams by Vibration- and Impedance-based Smart Technologies

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Recently, the development of smart technologies for structural health monitoring (SHM) of civil structures have been increasing. Structural health monitoring plays a significant role for the structural safety and sustainability. In addition, prestressed concrete (PSC) beams have been widely used in the field of civil engineering. Therefore, the interest on the SHM of existing PSC beams has been also increasing. In this study, vibration- and impedance-based smart technologies are presented for SHM of PSC beams. The following approaches are implemented in order to achieve the objective. Firstly, smart sensors’ hardware and embedded software are designed for vibration and impedance monitoring. In the design, a sensor node to measure PZT’s dynamic strain is newly proposed. Secondly, vibration and impedance responses experimentally measured from a PSC beam are examined to verify the feasibility of the smart sensors for SHM. At least two behaviours of the PSC beam are examined as follows: 1) interaction between girder’s vibration and cable’s vibration and 2) effect of wind speeds on vibration and impedance responses. Finally, the accuracy of cable force monitoring by the smart sensors is evaluated for the PSC beam.

Keywords: impedance; prestressed concrete beam; smart sensor; structural health monitoring; vibration.
Local effect of column flange flexibility on shear lag in steel box moment connections

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This paper presents the shear lag phenomenon occurred in steel box moment connections by considering the local effect of column flange flexibility. The stress concentration due to shear lag in steel box member is one of the major concerns for steel box moment connections. When welding is utilized, the connections are susceptible to cracking or failure in the weld parts. Therefore, the maximum stress in the steel box moment connection is always checked during a preliminary design stage. In this study, the stresses due to shear lag were evaluated using least-work solution, considering the flexibility of column flange. The local flexibility of the connection, which caused by the column flange and diaphragms, is represented by an axial spring model, and contributed to stress distribution in the beam flange. Using the presumed longitudinal displacement functions for both the beam flange and web, the stress concentrations were evaluated to increase significantly compared with that obtained from a cantilever beam model. The finite element assessment was also conducted to check the validity of the manual prediction of the stress in various ranges of the beam and column section properties. The results are further summarized, discussed, and showed that more flexible column flange and diaphragm provided higher stress concentrations.

Keywords: Shear lag; box moment connections; column flange flexibility; diaphragm; finite element

Eco-efficient concrete containing recycled ceramic wastes aggregate

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The construction industry is in search of cleaner and greener alternatives for materials in concrete. The main objective of this study was to determine the properties of concrete using recycled ceramic waste
aggregates (CWA). In this study, natural fine and coarse aggregates were partially substituted as ceramic waste aggregate in the range of 25%, 50% and 75%. Fifty-four cubes and twenty-one cylinders were prepared and tested to obtain the physical and mechanical properties of concrete. The compressive strength of concrete specimens containing 50% recycled ceramic fine aggregates (CFA) and 75% recycled ceramic coarse aggregates (CCA) is greater than the conventional concrete. However, the modulus of elasticity decreased with increased recycled aggregate content. The aggregates replacement decreases the concrete density but satisfying the desired compressive strength of concrete. The results made it possible to adopt ceramic tile waste as recycled aggregate materials to promote sustainable development in the production of concrete.

Keywords: recycled aggregates, ceramic wastes, aggregate replacement, eco-efficient concrete

Social aspect implementation in sustainable construction

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The concept of sustainable development integrates social, economic and environmental dimensions. The applications of sustainability were applied in construction industry since they are inter-related. There are various models have been developed to monitor and ensure the sustainability concept are adapted in the construction process applicably. However, most sustainability studies that discussed in construction projects are more focus on environmental aspects rather than economics aspects and social aspects. Meanwhile, only a few studies are discussed on social aspects. Sustainability studies were fragmentedly discussed. Since social aspects in sustainable construction were not applied holistically in construction, therefore, this study tries to investigate the perception of industry on the implementation. Therefore, this study is conducted to identify the level of agreement to the implementation of social aspects in sustainable construction and the barriers faced to the implementation. A total of ten (10) social factors (accessibility, health, safety, human rights, education, equity, occupancy design requirement, culture, integrity and stakeholder’s involvement) and six (6) types of barriers (government enforcement, awareness, knowledge and experience, skills, involvement and cost factors) have been identified through literature review. The methodology of the study was using quantitative methods through the formulation of questionnaires distributed to respondents with experience and expertise in sustainable construction industry such as Green Manager (Architect, Engineer, and Quantity Surveyor), Town and Regional Planner and academician. The findings obtained through the mean score analysis have found that, the highest three (3) social factors on the agreement of the implementation of social aspects in sustainable construction which are the factors of occupancy design requirement, education and factor of involvement. Whereas the highest three barriers to the implementation were weaknesses of government enforcement, cost factors and stakeholder engagement in sustainable construction. However, there is no association between the numbers of years of respondent’s experience with the selection of social factors measured by using gamma test. Thus, it can
be concluded that not all aspects agreed by the respondents will influence the actual execution that they will perform in the actual situation at the site.

Keywords: Sustainable Construction, Social Indicators, Implementation

**Review of theory and design approaches for axial strengthening of R/C columns using FRP sheets**

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This paper presents a review of some theoretical concepts and formulations along with design approaches for strengthening of reinforced concrete columns using fiber reinforced polymer sheets (FRP). Existing studies and international design codes have proved that using of FRP sheets can increase the design strength and load carrying capacity for possible axial, shear or flexural stresses and allow the structure to carry more loads than it was originally designed for. The paper devoted to the synopsis, review of mechanical properties of FRP, observed behavior of FRP confined concrete. Also, the design assumptions and procedures are summarized and presented. The review concentrates on the balance between the required additional ductility for concrete columns and brittleness of the FRP sheets. Four international design guides were reviewed and summarized (ACI, CSA, Concrete Society, and fib). Also, a two solved design examples for FRP axial strengthening of circular and square RC columns according to ACI 440.2R-17 design procedure were summarized and presented.

Keywords: Fiber Reinforced Polymers, Concrete, Confinement, Strengthening

**Critical Green Road Criteria for Malaysia Green Rural Road Index**

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Malaysia is on its path in adapting the green roadway system. The introduction of green road rating tools such as Malaysia Green Highway Index (MyGHI) for highways and Penarafan Hijau (pHJKR Jalan) for non-toll roads which the value of the project are more than RM50 million are parts of the green initiatives taken towards the sustainable development in Malaysia. However, there is no specific green road rating tool focusing on rural roads in Malaysia. The rural road falls under the state road category, which contributes the largest proportion of the road network in Malaysia. The absence of specific green road rating tools for the assessment of the largest network of the road in Malaysia is seen as the gap that needs to be filled with a systematic approach. With that, this paper highlight the methodology of the study to develop a specific green road rating tool that suits the nature of rural road in Malaysia which is called Malaysia Green Rural Road Index (MyGreen RRI). It also aims to highlight a thorough comparative review of the established criteria of the existing international and local green road rating tools by using cross-national comparison. This comparative review leads to a set of proposed criteria to be used in MyGreen RRI. The analysis is later will be extended for the development of score and to be used for the assessment of MyGreen RRI. The establishment of MyGreen RRI as the later final output of is expected to benefit the nation in the environment, social and economic perspectives.

Keywords: Green Road, Rural Road, Green Road Rating Tools, Sustainable Infrastructure

Hardened properties of concrete with different proportion of crumb rubber and fly ash

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The utilisation of waste materials in concrete is one of the sustainable construction approaches introduced in the industry that can indirectly reduce the environmental issues arisen from the disposal problem of the wastes. The aim of this study is to investigate the hardened properties of rubberised pozzolanic concrete (RuPC) with different proportion of crumb rubber and fly ash as partial fine aggregate and ordinary Portland cement (OPC) replacement, respectively. The crumb rubber content replacing fine aggregate is in the range of 0% to 20% while fly ash replacing cement ranges from 0% to 30%. Testing of RuPC with different percentage of crumb rubber and fly ash were performed at the age of 28 days for density, compressive, splitting tensile and flexural strength, and were compared with properties of control specimens. Results showed that the density of RuPC decrease with increase in
crumb rubber and fly ash content. The overall strength of RuPC decrease as crumb rubber content increase in which 5% crumb rubber show the least reduction in strength. Replacing 10% cement with fly ash shows improvement in strength of RuPC when compared to specimens without fly ash, however still lower than strength of control specimen. The optimum crumb rubber replacement is 5% while fly ash is 10% to avoid significant reduction in strength.

Keywords: Concrete, Crumb rubber, Fly ash, Hardened properties

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**Awareness of Adopting Building Information Modelling – Consultants Case in West Sumatra**

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Building Information Modelling can support and make it easier for the project design planning process, managing schedules, budgeting, simulating, analysing and various other things so that it can help plan projects more efficiently, and accurately. The purpose of this study was to determine the awareness of consultants in West Sumatra to adopt Building information modelling. This research was conducted at Consultants who were in INKINDO and PERKINDO organizations in West Sumatra by randomly selected samples at 20 consulting companies. Data retrieval is done by random sampling with a structured questionnaire to 20 consulting companies. Furthermore, all questionnaires that were collected were analysed. From the results of the analysis it was found that the awareness to adopt Building Information Modelling on Consultants was still very low.

Keywords: Awareness, Adopt, Building, Information, Modelling, Consultant.

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**The Experimental studies of punching shear behaviour of reinforced concrete flat slab with the inclusion of steel fibre:**

**Overview**

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The application of flat slab in construction offers a good deal, whereby the elimination of beam could reduce the overall height of the building and self-weight of structure. However, a drawback is that a high concentration of shear forces and bending moments at the column peripheries are produced, which cause punching shear failure. Previous researches proved that an adequate mix composition of steel fibre reinforced self-compacting concrete (SFRSCC) has the ability to improve load carrying capacity and the energy absorption performance specifically in the slab-column connection. In view of this, this study reviewed parameters used by several previous experimental studies of the performance of steel fibre reinforced concrete in improving the punching shear strength of the flat slab. It was found that fibre volume fractions, preparation of material and size of specimen affect the efficiency of steel fibre in resisting the punching shear.

Keywords: Punching shear, steel fibre, self-compacting concrete, flat slab

### Sustainable use of Laterite Soil as Compressed Cement Stabilized Earth Block for Low Cost Housing Construction

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Developing countries facing challenges in provision of housing especially with the increasing population in Malaysia, large demand on the construction materials resulting the construction cost to increase tremendously. Using low-cost housing material will be beneficial to provide affordable housing in order to meet society needs. This study investigates the sustainable use of laterite soil as a construction material for the production of compressed earth block stabilized with cement. Engineering properties of the laterite soil were determined using moisture content, sieve analysis, Atterberg Limit and standard proctor test conducted. Stabilized compressed earth blocks were cast with various percentage of cement (2.5%, 5%, 7.5% and 10%), these compressed earth blocks were tested on unconfined compressive strength at 7, 14, and 28 days of curing. The strength of the sample increases with increasing of cement content and curing days. The highest compressive strength of compressed earth block achieved was 3.4 N/mm² with 10% of cement content at 28 days of curing. These 28 days UCS of cement treated laterite soil meets the minimum strength requirement which are 2.8 N/mm² and 1.4 N/mm² for load bearing internal wall and non-load bearing partitions as stated in Malaysian Standards.
Identifying of project manager competence factors in managing EPC projects in Indonesia

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Industrial projects are developing very rapidly by increasing the development of power plants, fertilizers, oil & gas (especially in Indonesia). The companies that have an important role in those development are EPC (Engineering, Procurement & Construction) companies. EPC companies are needed that have many experiences in planning and developing similar industrial projects. The advanced technology and the sophistication of the design process demands for more skilled Human Resources in which Project Manager to handle and complete these projects. Project manager is responsible for the overall success of delivering the owner's physical development in cost constraints, schedules, quality, safety and environmental requirements. Therefore, they play an important role not only in the operating activities of engineering construction companies but also in the development of infrastructure in each country including Indonesia. Two stages of factor analysis were conducted on competence factors than the International framework of Project Manager Competences Development Framework and competence factor based on the basic theory of competence. There are 140 competence factors appeared from its analysis. All factors have been validated by experts from the National Association of Design and Development of Indonesia (GAPENRI) as the institution that manages EPC companies in Indonesia, Project Management Institute (PMI) Indonesian Chapter and Indonesian Project Management Specialist (IAMPi).

Keywords: Project Manager Competency, Project Performance, EPC Project, Indonesia

Critical project manager competencies in managing highway projects in West Sumatera – Indonesia

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The Highway development projects currently being implemented in West Sumatra, Indonesia is important in increasing the competitiveness in the country’s economy. At the same period, it will also give a positive impression such as being able to reduce the cost of transportation, increase the quality of life, the value of use and labour productivity. The project managers play an important role in the success of the project. There is a consensus that project managers increase the likelihood of project success even though their projects face major problems. In this paper, the focus is on identifying the competency of Highway Project Managers in West Sumatera in carrying out the Project Management concept that leads to project success. Based on that and in accordance with this study, the approach used in data collection and processing is a qualitative approach. The results of the factor analysis are shown to experts, to establish that all these factors are important in development the performance of a project managed by the Project Manager. The results of the factor analysis derive 31 factors that are validated by the experts. And all these factors are crucial in determining the performance of the Project Manager.

Keywords: Project Manager Competency, Project Success, Highway Project, West Sumatera

**Effect of high temperatures on physical and compressive strength properties of self-compacting concrete incorporating palm oil fuel ash**

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Palm oil fuel ash (POFA) has been widely utilized to replace cement in self-compact concrete (SCC) to reduce the cost of its production, environmental pollution and health hazard caused in the cement production. However, the effect of high temperatures on SCC incorporating POFA has not been well established. The purpose of this research is to examine effects of high temperatures on the physical
and compressive strength properties of SCC incorporating POFA with replacement level of 20% by weight of cement. The compressive strengths of SCC specimens were evaluated at 28 days of curing using both cubes and cylinders. Thereafter, the SCC specimens were exposed to high temperatures of 200, 400, 600 and 800 °C using an electric furnace for a period of 2 hours after attaining the required temperatures. After exposure, mass losses together with residual compressive strength were determined. The results of the test showed that there was a continuous reduction in mass of the specimens with increase in temperature. The results also revealed that the colour of the specimens does not change at 200 °C but the colour changes started to occur between 400 °C up to 800 °C. There was an increase in the residual compressive strength for the two mixes at temperature range of 200 – 400 °C for the cubes and cylinders whereas at the temperature of 400 – 600 °C and 600 – 800 °C, there was a sharp reduction in the residual compressive strength for the two mixes for the cubes and cylinders. The SCC with and without POFA follow the same trends.

Keywords: Self – compacting concrete, Palm oil fuel ash, Residual compressive strength, High temperatures, Mass loss

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**Flexural strength improvement for structural glass: a numerical study**

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Glass is generally known as a fragile material. It is sensible to the cracks created from manufacturing or contact damage. The strength of a perfect glass without crack could reach 10 GPa. By mean of strengthening such as thermal tempering, glass can be safely use for building as architectural elements and very limited to the structural elements. The authors have been developing glass strengthening methods and structural design for large scale glass structure. Three factors have been considered: mechanical behaviour of glass at contact loading identified by nano-indentation and nano-scratch, geometrical optimized bolted connection for glass beam and chemical strengthening techniques, which allow using the glass material for structural elements more safely and efficiently.

Keywords: Glass strengthening, glass beam connection, structural glass modeling, optimization
Critical Risk Factor Affecting Project Performance In West Sumatera

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The construction industry has a very dynamic nature with threats that must be faced. Every construction project, risks must exist and are common except if the owner can transfer them to another party by paying compensation. In order for risk or uncertainty to be controlled and anticipated as early as possible, the risks that exist and potentially cause losses must be managed as well as possible. From the description above this study aims to identify critical risks factor (CRF) that occur in building projects that have an influence on contractors and analyse important risk factors that occur projects in the province of West Sumatra. The aim of the research was to identify and assess risk factors during the construction phase of construction projects in West Sumatera. Respondents of this study are Contractors, Supervision & Owner. Data retrieval is done by random sampling with a structured questionnaire. Furthermore, all questionnaires that were collected were analysed statistically, using Partial Least Square Structural Equation Modelling (PLS-SEM) with SmartPLS 3.0 program. The results showed the critical risks affecting project performance identified appears to be that most critical factor is project management risk, material risk, design and architect risk, equipment and also safety risk.

Keywords: Critical risk factor

Building Safety Indeks for Elementary School Building In West Sumatera

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Safety and health in building planning must be considered during the building service period. The research objective is the application of Safety Building Index (BSI) in elementary school building planning. The factors of previous research were six factors, and the authors assessed seven, namely architectural factors, building services, the external environment, operational and maintenance, administration and management of building maintenance. The research method was carried out by distributing questionnaires then distributed to construction practitioners such as architects, engineers, surveyors, contractors, consultants and developers. After completing the questionnaire, form to carry out the analysis with the SPSS program. The results of statistical analysis reveal the highest level of influence of each building factor on building planning. The research findings are the influence of each of the factors reviewed and which factors are dominant. The most dominant factors that must be considered by planners in designing elementary school buildings so that the Building Safety index can be applied in elementary schools in West Sumatra Padang.

Keywords: Building Safety Index, Elementary School

Tensile and Shear Strength of Four Species of Bamboo in Malaysia

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As one of the fastest growing plants on earth, bamboo has a lot of species that range in size from a few centimeters to many meters tall. Bamboo is a unique plant where it can reach their full height up to 30m in a period of 2 to 4 months. Even though bamboo has been used traditionally as a construction material for thousands of year, there are not many studies about the mechanical properties of the bamboo itself. Thus, this paper presents an investigation on tensile and shear strength of four species treated bamboos that are available in Malaysia, which include Bambusa Vulgaris, Dendrocalamus Asper, Gigantochloa Scortechinii and Shizostachyum Grande. All the test was conducted according to the International Standard Organization (ISO-22157-2004). From the test result, Bambusa Vulgaris and Dendrocalamus Asper possess high tensile strength, meanwhile, Gigantochloa Scortechinii shows the highest value of shear strength compared with other species. Moreover, the test result also shows that Shizostachyum Grande possesses the lowest tensile and shear strength. Thus, with the available data on bamboo properties, structural engineers should take the advantages of bamboo to be used as a construction material in modern design buildings.
A review on sources of carbon emission for airport

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The increase in carbon dioxide (CO2) emissions is becoming the crucial factor in the global warming problem. Airports play a vital role in the global air transport industry facilitating extremely energy-intensive areas. Airport buildings and its operation, which account for 40% of greenhouse gas emissions, play a pivotal role in global warming. Therefore, the impact of emissions cannot be ignored and initiative to reduce the carbon emission cannot be delayed, as they, along with new airport and runway, account for extensive carbon footprint. Hence, this paper review the source as well as the scope of carbon emission for airport operation and has identified the various source for each emission carbon for airport operation.

Keywords: carbon footprint, carbon emissions, airport operation

Analysis of Moisture Susceptibility of Hot Mix Asphalt (HMA) with Waterproofing Additives

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The growth of infrastructure in Indonesia has been growing fast, including the construction of road networks to support this growth. It is necessary to ensure that the all road pavements to be long lasting and to perform well. In Indonesia, asphaltic pavement surface is very common to be used as it is quick to construct and easy to maintain. However, due to the fact that Indonesia is a tropical country and its soil has a generally high groundwater level, it is very common to find that the asphaltic pavement
deteriorated earlier than its lifetime. The most commonly pavement failures found are potholes and stripping, which are related to water intrusion to the hot mix asphalt (HMA). This research aims to provide an analysis on the moisture susceptibility of HMA with the addition of waterproofing additives, namely the Wetfix-BE, Wetbond-SP, and hydrated lime. The Marshall, Cantabro Loss, and Indirect Tensile Ratio tests were undertaken to assess the performance of the prepared samples. It was found that the specimens that were prepared using hydrated lime, as an alternative and low-cost waterproofing additive, perform reasonably well compared to the specimens that were prepared using the other additives.

Keywords: hot mix asphalt, moisture, aggregate, Wetbond, Wetfix

Prioritization of identified environmental loss factor subject to offshore structure failures based on public perception

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Offshore accidents that result in oil spills that damage beaches and wildlife habitats. When oil slick reaches the beach, it also affects human settlement on the beach and mangrove forests etc. In short, an oil spill completely disturbs an entire ecosystem for a quite long period of time. This research present a study of the past accident related to the offshore oil and gas accident that contribute to environmental loss. Risk assessment is combination between two elements which is probability of failure (POF) and consequences of failure (COF). The COF is calculated by reviewing and ranking the potential consequences for the people, asset, environment and reputation. However, current database is not reported on the environmental loss due to offshore oil spill. Therefore, this study intended to terms the environmental loss in quantitative way. Referring to 9 cases of the worst offshore accident related to structure failure in the previous years (1969-2011), the cause of offshore accident subject to structure failure that contribute to oil spill and environmental loss in the previous cases was identified and categorized the environmental loss factor based on loss characteristics. Finally, data collected from the past accident is used to design the questionnaire survey in order to obtain the public perception and analysis is done by using average index of non-parametric test and analytic hierarchy process for prioritization the factor of environmental loss factor. This is a crucial contribution to the enhancement of the calculation of COF as well as risk assessment.

Keywords: Environmental loss factors, consequence assessment, offshore, risk
A Review on Coating Materials as Thermal Insulation

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Thermal insulation is a material that retards the rate of heat flow by conduction, convection and radiation. Insulation reduces heat loss through a wall by reducing the thermal transmittance (U-value) with further thermal benefits including warmer surface temperature and reduced air permeability through the wall. However, the application of insulation to walls and the resulting reduction in thermal conductivity should significantly contribute to an overall improvement in the energy performance of a building. The magnitude will depend on several variables such as building type, climatic conditions and performance of insulation materials. The reviews on the organic waste materials from plantation or agricultural sector have been conducted in order to investigate the potential of the incorporate waste materials as the housing wall with thermal insulation performance. There are many potential agriculture waste materials can be taken into measure. These agriculture waste materials have been proved to have the thermal insulation performance which is low thermal conductivity. The selected wastes that can be obtained around Malaysia especially Johor are coconut fibres, pineapple leaves, sugarcane bagasse and coffee ground. The further studies on these incorporate waste materials should be implemented in order to determine their structural engineering properties and thermal behaviour by modification of the waste ratio based on density, thickness and weight to fabricate the coating layers in order to achieve optimum thermal insulation performances.

Keywords: Thermal Insulation, Low Thermal Conductivity, Agricultural Waste Materials

Extraction and Analysis of Construction Safety Hazard Factors from Open Data

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Construction is one of the most injury prone industries worldwide. Concerns of health and safety of the employees in construction sites have been a vastly discussed topic for decades. In many countries, companies are required to report safety incidents by using catastrophe investigating report in their workplaces to relevant authorities whereby such data is made publicly available under the open data policy. These open datasets may be well structured or may require further preparation in order to be usable. Some datasets are in the form of reports, which require qualitative, textual analysis to extract insightful information. The purpose of this study is to extract safety hazard factors from an open dataset obtained from the US Occupational Safety and Health Administration, and to further analyse such factors using statistical analysis techniques. For each reported case, text analysis was carried out with the narrative data field describing the circumstances leading to safety incidents to extract safety hazard factors. These hazard factors were categorized into human factors, technical factors, external environmental factors, organizational factors and other factors. The results showed that hazards related to human factors are most common. Descriptive statistics also showed that the most frequent nature of accident was fractures and most frequently occurring accident event was falls to the lower levels. Such information can help to provide insights into the accidents occurred and how relevant authorities may devise strategies to improve construction site safety.

Keywords: Accident, Construction, Safety, Hazard, Text analysis, Fractures, human factors

Introducing Effective microorganism (EM) as Self-curing Agent in Self-cured Concrete

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The primary reason for the curing of concrete is to complete the hydration reactions of cement with other materials. However, the problem occurs when required, ideal curing becomes challenging due to various anomalous structural elements. To mitigate this issue, a bacterial solution known as Effective microorganism (EM) is introduced as an additive, due to its favourable surface tension, viscosity and solubility in water. Different percentage of water i.e. 0%, 5%, 10%, 15%, 20%, 25%, were replaced with EM. The optimisation of percentage replacement of EM based on the compression strength and water loss of concrete. The percentage of EM with 10% water replacing showed better compression
strength compared to other percentage replacement. With the optimum 10% percentage Compression strength was found 42 Mpa and 49 MPa compared with 33 MPa and 43 MPa with control samples with air and water curing respectively. The water loss reduced 2% with 10% EM replacement compared to the control sample. Results showed that 10% of EM is the optimum value to get desirable properties of concrete in air and water curing. EM can be used as a new self-curing agent as a novel approach in the area of self-curing concrete.

Keywords: self-curing, Effective microorganism, water loss

Precast connection behaviour using finite element

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Precast concrete structure is not a new system in construction industry. Despite the several of advantages offer like ease in installation process, there is still a weakness especially on the stability of the whole structure strength of connection. This issue has been a huge barrier in construction industry and become main interest topic for researcher. Connection strength is the most important part in precast system. Due to lack of standard, there are two common approaches in identifying strength and behaviour of connection which is through experimental work and computational modelling. In this study, corbel connection in beam-column are chosen as a model for conducting a 3-dimensional finite element analysis using ANSYS and validated with theory and experiments from previous study. Results show that precast corbel have rotational stiffness range 5.00 to 10.04 kNm/m.rad with ultimate capacity of moment range 105 to 124 kNm and found with only 10% different when compare to the experiment and theory. By establish the analysis and parameters, this computer analysis is an economical way beside conducting experiment in identifying the behaviour of other precast connection and in future researcher may gather all precast connection data for design purpose.

Keywords: corbel connection; 3-dimentional finite element analysis

Green Artificial Aggregates as Self-Curing Agent in Concrete

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Improper curing during concreting on site causing developed bad quality of concrete. The concept of self-cured concrete capable to mitigate the process of water evaporation and increase the capacity of water retention in concrete. Thus, the process of hydration occurred continuously and developed dense concrete. This paper presents the potential of green artificial aggregates as self-curing agent for normal strength concrete. In this study, normal granite aggregates was replaced by 10%, 20% and 30% of green artificial aggregates. Two types of curing regime were applied to the concrete specimens which is wet curing and air curing. The effectiveness of the green artificial aggregates as self-curing agent was evaluated in terms of workability, ultrasonic pulse velocity, and compressive strength at 3 and 7 days. The results showed that concrete with green artificial aggregates produced comparable performance with control sample. This shows that the green artificial aggregates has potential to be used as self-curing agent in concrete.

Keywords: Green artificial aggregates; self-curing agent; self-curing concrete

Concrete material has low tensile strength and brittle characteristics. The solution to overcome this weakness is using ductile materials such as steel fibers. The use of steel fibers has constraints in workability. To facilitate work in the field, it was developed to become self-compacting concrete (SCC). SCC which uses additional steel fibers is known as steel fibers reinforced self-compacting concrete (SFRSCC). The development of steel fiber shapes from beginning to the present has produced many types of shapes, including straight, crimped, and hooked. Based on the various shapes of steel fiber, further development of SFRSCC technology needs to be carried out. This paper analyzed the influence of steel fiber types consisting of the three types of shapes on the physical and mechanical properties of SFRSCC. The methodology in this paper is to use a literature review and experimental methods. The results of the analysis show that all types of steel fibers result in a decrease of workability. The most decreased workability contains steel fibers of hooked type, and while the least decreased one used steel fibers of straight type. The results of the mechanical properties analysis showed the opposite, the largest increase in mechanical properties was obtained using hooked type, and straight type. For optimum
physical and mechanical properties, crimped type is recommended as a type of steel fiber in the SFRSCC.

Keywords: Physical and mechanical properties, Steel fiber, Steel fiber reinforced self-compacting concrete.

Critical Success Factors on the Implementation of Industrialized Building System in West Sumatra

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The construction industry in West Sumatra, Indonesia is experiencing a serious challenge since the occurrence of the devastating earthquake in September 2009. The Infrastructures including residential housing, government offices, roads and bridges were damaged and destroyed. The major problems facing the construction industry is mostly related to poor planning, lack of standards for quality project implementation and poor processing time. One of the possible answer to answer these problems is to introduce Industrialized Building System (IBS) in the construction industry. The aim of the study described in this paper is to identify the critical success factors (CSF) for the successful implementation of IBS in West Sumatra. The main methodology involved questionnaire survey to various stakeholders of the construction industry who have had experience dealing with IBS construction methods. The results and findings reveals that there are twenty-two critical success factors that need to be considered by the industry in order to ensure the success of IBS implementation. The factors can be grouped into several distinct classifications. It is expected that the findings form this study serve as a gateway for encouragement towards proper implementation of IBS in West Sumatra.

Keywords: Industrial Building System, West Sumatra Construction Industry, Success Factors

Slope Stability Analysis along the Road between Yinmabin and Kalaw in Mandalay Region and Shan State, Myanmar

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Slope stability analysis along the road between Yinmabin and Kalaw, in Mandalay Region and Shan State was carried out aiming to gain preventive measure for the landslide due to the lack of consideration on landslide hazards and associated risk. The rocks comprise the sedimentary rocks of Plateau Limestone Group, Loi-an Group and Kalaw Red Bed, and the Yinmabin Metamorphics. Notably, four types of landslides such as rockfall, debris flow, creep and slump have been identified along this road. Rockfall is the commonest landslide mainly occurs along the manmade road cuttings generating potential threats to human life triggered by heavy and prolong rainstorm. Slope Mass Rating (SMR) values indicated that Yinmabin Meamorphics is the most vulnerable to landslide. Three types of failures such as wedge, plane and toppling failures are confirmed by kinematic analysis. Moreover, a total of three landslide hazard zones is interpreted based on geological and geotechnical parameters. These zones are described as Landslide Hazard Zone I (west of Yinmabin), Zone II (eastern part of Yebokson and western part of Kyatsakan) and Zone III (the area between Nampandet and Wetphuye). Remedial measures have been proposed to mitigate the hazard.

Keywords: Slope stability analysis, landslide, slope mass rating, kinematic analysis

The Importance of Contractors’ Performance Appraisal System for Biophilic City Development in Malaysia

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Biophilic city is a new term of sustainable cities that connects human to nature by lessening the barrier between them. With a few additional elements from the sustainable city approach, the biophilic city brings human to nature instead of nature to cities or human as adopted by the former concept. Since biophilic city is a new approach not just in Malaysia but worldwide in general, no guideline has been published including the appraisal system on the contractors undertaking biophilic city projects. Many problems occur in the construction industry, and it persists across different projects. Problems related to performance, safety and environment amongst all need to be controlled by both the government agencies and private bodies such as developer and consultant. Even so, the contractor’s appraisal system should also be implemented to ensure the above problems can be reduced or eventually avoided. If regular development facing those problems, a new approach of cities development will face even worst. Hence, this paper, via literature review, aims to investigate the importance of contractors’ performance appraisal system for a biophilic cities development project in Malaysia. This found that: (1) since biophilic city is alien to many, appraisal system for contractor’s performance is important; (2) the
current contractor’s appraisal system should be improvised by adding the biophilic elements and; (3) contractors need to mutually understand the appraisal system and the concepts of biophilic cities approach. Since there is a significant need to implement the contractor’s performance appraisal in biophilic city development in Malaysia, this paper suggests that a deeper study in terms of the critical success factors of current contractor’s performance appraisal system should be conducted as to ensure their best performance in reducing or avoiding future problems in biophilic city development in Malaysia.

Keywords: Appraisal System; Biophilic City; Contractor’s Performance; Malaysian Construction Industry

Influence of Rust Removal Process on the Effectiveness of Sacrificial Anode Cathodic Protection in Repair Concrete

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The accumulation of corrosion product on the steel surface may cause eventual failure to deliver of ionic current protection from sacrificial anode cathodic protection. The effect of cleaning of deteriorated steel bar before cathodic protection application is studied in this paper. Two specimens having a length of 580 mm and 150x100 mm of the cross-sectional area with deteriorated reinforcing bar and half-part of chloride contaminated concrete were fabricated to simulate the repair process. Two corroded reinforcing bar with the same surface condition (ø 13mm) were embedded in concrete parallel to each other with the intermediary distance of 40 mm and the cover depth of 30 mm in the bottom surface of the specimen. In the first specimen, rust on the steel bar surface in the repair section was removed. Discrete sacrificial zinc anode is connected to one steel bar in the repair section. During three-years observation, the specimens were exposed to several conditions: 20°C air curing, dry-wet cycle, dry laboratory air, and wet condition, respectively. Potential of both rebar and the sacrificial anode was monitored to understand the performance of the cathodic protection system. The result indicates that
rust removal process of steel bar surface in repair concrete part is the most desirable initial condition when the sacrificial anode is applied on it to protect corroded steel bar in new and existing concrete.

Keywords: rust removal of reinforcing bar, sacrificial anode cathodic protection, repair concrete

Structural Damage Localization and Evaluation of the Reinforced Concrete Frame Structure by Acoustic Emission Technique

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Acoustic emission (AE) is an important non-destructive evaluation (NDE) technique used in the field of structural engineering for both case local and global monitoring. In this study AE technique was employed to investigate the process of fracture formation in reinforced concrete structure. A number of reinforced concrete (RC) one story frames were tested under loading cycle and were simultaneously monitored using AE. AE data can be evaluated by means of several methods. Relaxation ratio and Calm and load ratio which are derived from events during unloading and loading are reasonable methods for evaluation structure under cyclic load. Also, the relaxation ratio was dominated with approaching load to 58% of the ultimate load. Three levels of damage using Calm and Load ratio were distinguished. The trend of Relaxation ratio and Calm and Load ratio method during loading and unloading showed that these methods are strongly sensitive with cracks growth in RC frame specimens and were able to indicate the levels of damage.

Keywords: Damage Evaluation, Reinforced Concrete, Acoustic Emission

Influence of Marine Kaolin Mortar Mixed with Effective Microorganism on External Heat Transfer

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Marine kaolin can be found easily at the coastal regions in Malaysia. During infrastructure works, huge quantities excavated and is treated as unsuitable soil material (USM). This study offers a value-added solution to convert marine kaolin into supplementary cementitious material through thermal activation and 10% replacement of Ordinary Portland Cement, also incorporated the usage of Effective Microorganism (EM) into the mortar mix. The usage of EM between 5% and 25% with increment of 5% were to enhancing the properties of mortar. The intention of corporating both marine kaolin and EM to form mortar mix was to observe the significant effects on heat transfer. As a result, the surface temperature of the mortar was reduced up to 8% and thermal conductivity performed appropriate insulating materials.

Keywords: Effective Microorganism; Marine Kaolin; Mortar; Thermal Conductivity; Surface Temperature.

Improving Strength of Porous Asphalt: A Nano Material Experimental Approach

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Porous asphalt (PA) has potential to be utilized in many urban area in Indonesia which often faced high street runoff during rainy season. PA is an environmentally friendly tool for stormwater management. A typical porous pavement has an open-graded surface over an underlying stone recharge bed. The water drains through the porous asphalt and into the stone bed, then, slowly, infiltrates into the soil. However, despite of the benefit of porous asphalt, there is still weaknesses, such as less of service life than dense-graded asphalt due to its lower durability and strength. In order to improve durability and strength of PA, this study investigates the effect of using fly ash (FA) class F in porous asphalt (PA) mixture as replacement of common filler. Since asphalt pen 60/70 is mainly binder material in Indonesia, it is used as the default for all samples in this experiment. The optimum bitumen content (OBC) was determined for all the mix by Marshall mix design. In view of the nanomaterial approach, samples were then prepared for the same optimum bitumen content (5.85%) by using Bina-Marga’s PA standard in control mix as well as natural FA and treated FA as alternative filler in modified mixes. Treated FA itself has been milled using transversal ball mill machine for 3 to 6 hours. Experimental results indicated higher stability value and reduction of permeability with the same OBC for the mixture having treated FA as filler content in comparison with standard mix and natural FA mix. It is proposed that additional finer material of treated Fly ash as alternative filler added into asphalt mixture resulted
in improvement strength. In order to do that, the required amount of treated Fly ash should be less than 200 grams.

Keywords: Porous asphalt, nanomaterial, durability

Evaluation of Crop Water Requirements for Yazagyo Irrigated Area, Myanmar

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Accurate estimation of crop water requirements (ETc) is essential for the irrigation scheduling and water management of Yazagyo irrigated area, Myanmar. Because of the depth of water needed to meet the water loss through evapotranspiration of a crop, being disease-free, growing in large fields under non-restricting soil conditions, including soil water and fertility, and achieving full production potential under the given growing environment. It is essential to have a clear idea about the optimum water requirement for proposed crops under adaptable climatic conditions. The optimal crop water requirement mainly depends upon the accurate estimation of evapotranspiration and crop coefficient. To perform in this study, firstly Meteorological data of Kalay Station, in Myanmar are collected from 1995 to 2018. On the other hand, the different kinds of crops such as paddy, groundnut, sesame, sunflower, bean, and pea are considered for the estimation of seasonal crop water requirements for this area. Based on the crop growth stages in this area, crop coefficient curves are developed and crop coefficients are determined for each crop according to FAO manual. By using monthly crop coefficients and CROPWAT 8.0 software, reference crop evapotranspiration, crop water requirements and total irrigation requirements are presented for the selected area.

Keywords: Yazagyo irrigated area, Evapotranspiration, Crop coefficients, CROPWAT, Crop water requirements, Total irrigation requirements

Specification for Torsional Bracing Design of Steel I Girder Simple Span Bridges during Construction Stage

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Nowadays, steel bridge structure is becoming the trend of highways and bridges construction industry on not only the material characteristic but also its ability to be manufactured easily and reduce the constructing time. However, this structure still has its own disadvantages. One of the most critical factors greatly influencing the performance of the whole structure is the buckling capacity of the main girders, especially during construction stage. The most common solution for increasing the structure’s buckling capacity is to provide it with discrete bracing along the girder’s length. The designing of bracing for steel bridges requires high precision. If the design of the system is much stiffer than it demands, the structure will easily be prone to fatigue problems. In the other hand, if the bracing design does not meet its required stiffness, the whole structure’s stability will greatly reduce. Presently, many projects are designed too sufficiently leading to a huge waste of cost and time. Therefore, the expected results of this study are to propose an optimal design process for the bracing system design of steel I girder simple span bridges and a finite element model of a real-life steel bridge to confirm the reliability of the specification proposed.

Keywords: Bracing for steel bridges, Cross-frame, Diaphragm, Stability

Alkali-Activated Binder as Stabilizer in Compressed Earth Blocks

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Compressed earth blocks (CEB) has number of advantages: cost and energy efficient, eco-friendly, non-toxic, and fireproof. It is composed of available compressed soil near project site with binders as stabilizers. From literature, adding ordinary Portland cement (OPC) as stabilizer is practiced. However, the use of OPC produces high carbon footprint in its production phase. This paper aims to use Alkali-activated (AA) binder as stabilizer for the CEB to promote sustainable construction. It uses a combination of fly ash (FA) mixed with Sodium Hydroxide (NaOH) to produce the stabilizer. Compressive strength and water absorption using AA binder as stabilizer in CEB are investigated. Total of fifty-two CEBs with dimensions of 295mm x140mm x100mm are made as an alternative to conventional concrete hollow blocks with a minimum value of 2.50MPa compressive strength from the provision of Philippine National Standard (PNS). The AA binder ratio of 5% and 15% produced compressive strength of 0.42MPa and 2.92MPa, respectively. Additionally, AA binder ratio of 10% produced lowest percentages of water absorption at 12.83%. It shows that the use of CEB with AA binders is possible in achieving sustainable construction building materials.

Keywords: Compressed earth block, Alkali-activated binder, Compressive strength
Load Distribution Characteristic of Road Base Layer under a Static Surface Loading

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Road base layer has a unique way in distribute the stresses. Unlike a concrete layer which rely on its flexural strength, the road base layer transmit its working load by grain-to-grain contact. Many aspects will affect this load transfer system, for example the aggregate type, shape, and strength. In general, the stress distribution in road base layer is similar to the stress distribution in soil. One of the most acknowledge theory is the 2:1 method to analyse the stress distribution. However, the 2:1 method is just an approximate and limited in use in the area under the footprint of the load. Since then, theories were developed to obtain an accurate analysis for stress distribution. In this research, the fibre optic sensing were used to obtain the strains of the load under the road base layer. By knowing the strains under the road base layer, then the stress distribution on the road base layer can be obtained. Two samples were tested in this research. Sample A was a road base layer constructed from natural crushed aggregate (NCA), and sample B was constructed from recycled concrete aggregate (RCA). The dimensions of the samples is 1 m x 1 m with 200 mm of thickness. A static load was applied on the road base layer surface and the fibre optic sensing will measure the strains at the bottom of the road base layer.

Keywords: fibre optic, road base, stress distribution

Removal of Ammonia by Palm Oil Clinker (POC) as Submerged Fixed Media in Sequence Batch Reactor (SBR) Mode

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Currently, utilization of waste by-products or waste materials have received attention globally as it brings significant economic and environmental impacts. In this study, palm oil clinker (POC) which is one of the waste by-products generated in the processing of palm oil was utilized as submerged fixed media in Sequence Batch Reactor (SBR). By using POC as filter media for wastewater treatment, it is
able to extend the useful life of POC and reduce the demand manufacturing new media. SBR is a fill-and-draw type reactor system which allow all activated sludge process to occur over a series of time in a single complete-mix reactor. During the operational steps of SBR, the combined attached growth/activated sludge system will promote the growth microorganism that attached on the media in the activated sludge process to remove pollutants such as organic matters and nutrients passes through the media. Laboratory-scale of two Sequence Batch Reactors (SBR) was fabricated with one of the reactors filled up with POC submerged fixed media. Influent of domestic wastewater from Universiti Teknologi Petronas (UTP) ’s Sewage Treatment Plant (STP) was adopted for wastewater treatment. Based on the result obtained, SBR reactor with POC submerged fixed media has higher ammonia removal efficiency, which approximately 90% than the SBR reactor without POC submerged fixed media, which approximately 85%.

Keywords: component; palm oil industry; wastewater treatment; waste by-products

Issues and Challenges in the Implementation of Public Housing Redevelopment Projects Due to Earthquake

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The post-earthquake housing redevelopment projects success will be much affected when facing with labor, technical staff and experts who are not competent in their field. Moreover, materials scarce supply can cause poor quality of work. At the same time poor community involvement and other important factors that may hinder the project success. Assessment needs also to be carried out in determining the level of damage, location and community conditions so that successful reconstruction can be achieved. This paper provides an overview of the issues and challenges in the implementation of public housing redevelopment projects due to earthquake. The methodologies adopted were mainly focusing on analyzing the information gathered through review of literature and observations made based on personal experience involving in housing redevelopment projects. It was discovered that the most common problem in post-disaster housing redevelopment is funding. In many instances the government is expected to provide funds earlier. Housing redevelopment project can be an opportunity for corruption which causes loss of project funding, injustice and community rights. Redevelopment projects require top managerial coordination to avoid the ineffectiveness and repetition. Effective policies and strategies are very important to ensure that people's lives are returned to a better condition and are able to withstand future disasters. Identification of ownership and loss of land documents needed to be identified to prevent the redevelopment process from being hampered and delayed. In order to ensure successful implementation of reconstruction projects issues and challenges that influence its success need to be addressed early.

Keywords: housing redevelopment, post-disaster, earthquake
Community Based Approach in the Implementation of Rehabilitation and Reconstruction Project After Earthquake in West Sumatera

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The paper describes the construction process through community based approach for the rehabilitation and reconstruction of houses affected by the 2009 West Sumatran Earthquake. Community empowerment approach is highlighted considering its sustainability to strengthen the capacity of community in order to reduce disaster risk. The activities involved in rehabilitation and reconstruction of houses through community based approach include building new houses, restoring damaged houses, or helping citizens who have difficulties. Generally, the community empowerment concept will run effectively if it is designed properly. To encourage community based development on a large scale, it is important to first understand the group or community itself. Adopting a clear strategy to community based development is also important. There are four important strategies may be adopted by the project manager to encourage support for community based approaches and ensure project effectiveness, which are stakeholder engagement, consultation with different stakeholder, pioneering activities, and structured learning. Previous studies have indicated that the rehabilitation and reconstruction process in the aftermath of the 2009 West Sumatran Earthquake had not actively empowered the society. It is recommended that future redevelopment projects have to be planned in such a way that community empowerment is maximised.

Keywords: based: rehabilitation and reconstruction: earthquake

Flexural Strength of Concrete on Different Water-Cement Ratio and Notches

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Flexural strength of concrete often treated minimally by assuming there is no significance impact on overall concrete strength. However, from fracture mechanics point-of-view tensile is an element the mechanics always look into due to cracking does associate with tension. In the research, fracture is translated into physical laboratory experiment by introducing notches. Physical laboratory works on concrete beams with three-point bend test configuration under static loading and calculating outputs from laboratory with numerical equations. Three-point bend test method is conducted because from the testing, tensile strength or also recognised as flexural strength of concrete for each water-cement ratio could be attain. Thus, the ambition of this article is to reveal and discuss the pattern of flexural strength of concrete on different water-cement ratio. The testing follows conventional fracture three-point bend test on concrete but with revised version by testing notched concrete beams. Normal three-point bend tests were run on concrete beams with different notch sizes; 30 mm, 15mm, and 5 mm respectively. There were three water-cement ratio decided in concrete mix; 0.3, 0.4, and 0.5. Thus, the trend of flexural strength of concrete follows the trend of water-cement ratio. Flexural strength increases when water-cement ratio increases up to water-cement ratio 0.5.

Keywords: Flexural strength: water-cement ratio: concrete

Application of Circular Economy in the Indonesia Construction Industry

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The Circular Economy (CE) is a concept that aims to keep the value of products, materials, and resources economically as long as possible while minimizing the waste produced. The CE concept is adapted from the 3R principle (Reduce, Reuse and Recycle). The construction industry is one of the largest waste-producing industries. In fact, 30% of the waste in landfills is construction waste. This study aims to identify and analyze the application of circular economy in the construction industry in Indonesia. There are two main stages in this study. The first stage was to identify construction practitioners' awareness of the circular economy. The second stage is to document the implementation of 3R on various types of construction projects such as building, road, and bridge projects. The questionnaire was used to collect data. Around 120 project manager of medium to large scale construction companies in Indonesia were used as respondents. Important Performance Analysis (IPA) is used to represent construction practitioner awareness of CE. The results show that most construction practitioners in Indonesia have understood the importance of construction waste treatment in the context of a circular economy. However, only a few construction companies that seriously take care of construction waste treatment. Most construction waste is only released to the landfill area through the third parties. Only about 36% of contractor reused and recycled waste is in the construction site.
Keywords: circular economy: reduce: reuse: recycle: construction industry: Indonesia

Technology Assessment in Indonesian Construction Industry

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In the last decades the Indonesian construction sector has experienced significant shift in both the size and complexity. With the increasing growth of major investment in public infrastructures, the demand for construction is expected to grow even higher. The ever-growing size and complexity of construction and infrastructure works often required the employment of non-traditional construction methods and technology. Responding to such needs, however, there remain questions on whether the construction industry is able to respond to such challenges. This paper is to put forward the concept for assessing the technological capability of the Indonesian construction industry. In particular, it will discuss how the engineering and construction companies evolve in their technological management capability. The assessment will encompass three aspects: technological capacity, development of technology capability and acquisition and adoption of technology. A technology management assessment concept was proposed to determine key factors that influence the way construction companies select and utilize technology to enhance their performance. This approach is expected to provide different paths of construction technological development with regards to different characteristics of construction companies and business as well as addressing the geographic characteristics of Indonesia.

Keywords: construction: technology: assessment

Properties of Oil Palm Shell Lightweight Aggregate Concrete Containing Fly Ash as Partial Cement Replacement

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In Malaysia, the growing palm oil business and increasing energy consumption that pushes more coals supply for power generation at power plants generates by-products. A large amount of oil palm shell from palm oil mills and fly ash from coal power plant still disposed as waste. At the same time, the expanding cement and granite industry to cater the construction industry need also causes environmental degradation that requires solution. Thus, incorporation of the industrial solid wastes as alternative mixing ingredient in production of zero granite concrete production is seen as one of the viable approach to reduce waste thrown at landfill. The present research investigates the mechanical performance of palm oil waste lightweight aggregate concrete containing fly ash as supplementary cementitious material. Five concrete mixes were prepared by varying the quantity of fly ash added that is 0%, 10%, 20%, 30% and 40% by the weight of cement. All specimens were air cured until the testing age. Then, the specimens were tested to determine compressive strength and flexural strength up to 28 days. The finding shows that integration of fly ash up to 30% produces concrete that is suitable for load bearing application. Conclusively, approach of integrating fly ash in lightweight aggregate concrete would reduce cement consumption and fly ash disposal.

Keywords: sustainable concrete; oil palm shell lightweight aggregate concrete; fly ash; partial cement replacement; mechanical properties
Concern towards degradation of environment due to increasing use of natural sand in construction industry and dumping of solid wastes namely palm oil fuel ash and oil palm shell by palm oil industry has lead towards the development of environmental friendly concrete. The present study investigates the effect of unground palm oil fuel ash as partial sand replacement towards workability and compressive strength of oil palm shell lightweight aggregate concrete. Two types of mixes were used. Control specimen was prepared using 100% natural sand. Another type of mix were prepared by integrating various percentages of unground palm oil fuel ash as partial sand replacement. The concrete mixes workability were investigated by conducting slump test in accordance to standard. All specimens were made in form of cubes and water cured until the testing age. The compressive strength test was carried out in accordance to BSEN12390: 3 at 1, 7 and 28 days. The finding shows that integration of unground palm oil fuel ash at suitable proportion contributes to the enhancement of oil palm shell lightweight aggregate concrete properties.

Keywords: lightweight aggregate concrete; palm oil industry waste; palm oil fuel ash; partial sand replacement; compressive strength

Stabilisation of Sohar’s Sabkha Soil using Waste Gypsum Plasterboard

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Optimum comfort factors help in enhancing effective learning process in a classroom. The aim of this research is to study thermal comfort in school classroom for a more desirable learning process. Four schools consist of urban and rural schools in Selangor were selected for this study. Field measurement and questionnaires was used to measure the level of comfort and satisfaction of school teacher and student in classroom. Data Sabkha soil are salt-encrusted desert flats typically found in arid regions. Construction developments on naturally occurring Sabkha soils are usually problematic. This study examines the properties of Sabkha soil obtained from Sohar city of Oman. The Sabkha soil samples were further treated with Gypsum obtained from waste plasterboards at varying percentages of 3, 6, 9 and 12 with a view to stabilising the soil. From the results, Sohar Sabkha soil is a poorly graded sand (SP) with AASHTO classification of A-2-7(0), therefore, it is unsuitable for supporting infrastructures in its natural form. The pH test confirms the reaction between Sabkha and Gypsum, while both the compaction and unconfined compression strength (UCS) tests revealed the optimum percentage of gypsum required to enhance the properties of Sabkha soil to be 6%. The California Bearing Ratio (CBR) test yielded a 33.3% increase in CBR value for Sabkha treated with 6% of Gypsum over untreated Sabkha. Overall, a better understanding of sabkha soil and the confirmation of the potential use of Gypsum for its stabilisation was achieved in this study.
The Influence of Palm Oil Fuel Ash on the Fresh Properties of Green Self-Compacting Concrete

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This paper investigates the influence of palm oil fuel ash (POFA) on the fresh properties of green self-compacting concrete (GSCC) via the slump flow, slump flow T500, L-box, and sieve stability tests when 0%, 20%, 40%, and 60% of the Portland cement content was replaced by POFA on mass-for-mass basis. The slump flow values obtained were 695 mm, 720 mm, 732 mm and 740 mm for OPC-SCC, POFA-SCC20, POFA-SCC40 and POFA-SCC60, respectively, and the slump flow T500 values were 3s, 2.8s, 2.5s and 2.4s for OPC-SCC, POFA-SCC20, POFA-SCC40 and POFA-SCC60, respectively. The results obtained for slump flow and slump flow T500 were satisfactory, whereby the inclusion of up to 60% POFA improved both the slump flow and slump flow T500 values. In addition, the L-box results also showed that the inclusion of POFA in the GSCC exhibited a greater passing ability performance. The sieve stability test proved that the higher the POFA content, the better the segregation resistance index of the GSCC. Thus, the overall results portrayed that it is very much viable to produce GSCC utilizing up to 60% POFA with improved fresh properties.

Keywords: palm oil fuel ash: green self-compacting concrete: fresh properties: slump flow: passing ability

Influence of Epoxy Resin without Hardener On the Microstructure of Mortar

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The principal of molecular structure of cement mortar is important as it shows a component and interaction between cement and additive. By using a thermogravimetric analysis, the phase of mortar structure when exposed to high temperature can be determined. This paper presents the study on influence of epoxy resin without hardener on the microstructure of mortar. Mortar specimens were prepared with mass ratio of 1:3 (cement: fine aggregate), water-cement ratio of 0.48 and 5 to 20% epoxy resin of cement content. All tested specimens were subjected to wet-dry curing; where compressive strength, apparent porosity, thermogravimetric analysis and fourier transformation infrared spectroscopy were measure. Result shows that, all strength properties of epoxy mortar were significantly higher than control sample and became constant at 10% of epoxy resin ratio. Thermogravimetric analysis shows the weight loss of epoxy mortar was almost similar for various percentage of epoxy resin while from fourier transformation infrared spectroscopy test, the component of epoxy mortar and normal mortar was significantly different.

Keywords: epoxy mortar: compressive strength: thermogravimetric analysis: fourier transformation infrared spectroscopy

Screening of Native Ureolytic Bacteria for Self-Healing in Cementitious Materials

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In recent years, microbial calcium carbonate has been recognised for its potential to self-heal cementitious material by mimicking the natural biological systems of healing wounds. Thus, the inevitable microcracks and concrete pores can be filled with microbial calcium carbonate to prevent any aggressive chemical flow or water and prolong the life span of the structure. Recently, numerous studies have reported on bio-concrete incorporating bacterial species such as B. sphaericus and B. pasteurii, although there are limited studies on the B. pseudomycoides species. In this study, new native ureolytic bacteria were isolated from soil samples collected in Universiti Teknologi Malaysia. The morphology, characteristics, and ureolytic production of the bacteria were investigated through biochemical tests. The bacterial enhancement efficiency of the concrete compressive strength was also examined. The results demonstrated that the bacteria are gram-positive with encouraging characteristics such as endospore formation, which is required for application in harsh environments such as concrete. The native bacteria also demonstrated high urease enzyme productivity. Furthermore, the applicability of the bacterial spores and vegetative cells-urea solution as a healing agent in concrete. This was demonstrated by increasing the strength by 10% and 15% compared to the control sample with the
optimum cell concentration of 2×10^7 cell/ml. This finding was attributed to the precipitation of calcium carbonate in the pore volume and confirmed by X-ray diffraction (XRD).

Keywords: self-healing concrete: microbail calcium carbonate: ureolytic bacteria

Flexural Performance of Cold-Formed Steel Section in a Composite Beam System

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The application of Cold-Formed Steel (CFS) as a structural member in buildings as composite associate was rarely demonstrated due to limited technical information available about its usage in the system, despite the prospects of the CFS section in the composite system of construction in buildings as well as in light weight industrial applications as nowadays proven. Therefore, this paper aimed at demonstrating the potentials of using CFS section as a structural member in a composite beam system. Four-point bending test was used to determine the flexural strength capacities of the composite system. Results of flexural tests conducted on the composite specimens incorporating the CFS coupled with bolted shear connector proved it to be structurally feasible. In conclusion, the CFS can be employed as a structural member to eliminate the use of Hot Rolled Steel (HRS) section in small and medium size buildings and in lightweight industrial composite constructions as demonstrated environment comfort level can lead to positive impact to the user especially for learning environment.

Keywords: cold-formed steel section: composite beam system: flexural strength capability: hot rolled steel section: structural member

Observation of Temporary Accommodation for Construction Workers According to Code of Practice for Temporary Construction Site Workers Amenities and Accommodation (MS2593:2015) in Johor, Malaysia

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The Malaysian government is currently improving the quality of workers temporary accommodation by introducing MS2593:2015 (Code of Practice for Temporary Site Workers Amenities and Accommodation) in 2015. It is in line with the initiative in the Construction Industry Transformation Programme (2016-2020) to increase quality and well-being of construction workers in Malaysia. Thus, in order to gauge current practice of temporary accommodation on complying with the particular guideline, this paper has put forth the observation of such accommodation towards elements in Section 3 of MS2593:2015. A total of seventeen (17) temporary accommodation provided by Grade 6 and Grade 7 contractors in Johor were selected and assessed. The result disclosed that most of the temporary accommodation were not complying with the guideline, where only thirteen (13) out of fifty-eight (58) elements has recorded full compliance (100%), and the lowest compliance percentage (5.9%) are discovered in the Clause 3.12 (Signage). In a nutshell, given the significant gap of compliance between current practices of temporary accommodation and MS2593:2015, a holistic initiative need to be in place for the guideline to be worthwhile.

Keywords: temporary accommodation: construction workers: observation

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**Experimental Study on Composite Connection with Double Lipped C-Sections**

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The application of Cold-formed steel (CFS) is getting popular in several countries, and this indicates that a good potential of using lightweight materials as an alternative solution to conventional steel. However, there is still a lack of information about joint behavior, particularly composite connections integrated with CFS. This paper presents an isolated joint test of composite joints consisting of concrete slab 100 mm thickness, double lipped channel section used for beam and column, connected by hot-rolled steel gusset plates and bolts. The weakness of the thin plate behavior in the compression zone was reduced by installing the angle stiffener on the web column. Two specimens with same configuration but with and without seat angle were tested. The experiment results revealed that by the use of seat angle, the moment resistance and stiffness of joint’s increased with the ratio 1.06 and 1.19 respectively.

Keywords: composite connection; double lipped channel section; concrete slab; column web; moment resistance

Cold-formed steel (CFS) members designed with proper stiffener can significantly increase the loading capacity of connected member even though they are thin and slender. Design recommendations of connections especially for CFS sections are mostly related to the load carrying capacities of individual fasteners such as bolts, screws, and rivets. The proposed bolted top-seat flange cleat joint in this paper should be able to categorise as semi-rigid that can further enhance the use of CFS in structural steel. This could be a good potential to serve steel in a cost-effective construction. This joint profile offers simple configuration in fabrication and installation, and requires no welding. This paper aims to
investigate the behavior of cold-formed steel section with gusset plate integrated with angle cleats. Full scale of isolated joint test was conducted on three specimens that have the same dimension of column of size C300 with 2.4mm thick and beams of size C200, C250, and C300 with 2.4mm thick. The connections were stiffened with a rectangular gusset plate and flange cleat of 10 mm and 6 mm thick respectively. The comparative results showed that the increasing of gusset plate thickness could significantly increase the moment resistance of the connection. The moment resistance (Mj) of the connection connected to beam sections for C20024, C25024 and C30024 were 45.3 kNm, 48.8 kNm and 52.5 kNm respectively. The initial stiffness (Sj,ini) of the connections connected to the beam section C20024, C25024 and C30024 were 510 kNm/rad, 650 kNm/rad and 610 kNm/rad respectively. It can be concluded that the increased in the beam size tends to increase in the moment resistance and the initial stiffness of the proposed connection.

Keywords: connection: gusset plate: cold formed steel: flange cleat: moment resistance: stiffness

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Flexural Behaviour of Interlocking Brick System with Grout Cement Mixed with Various Fibre

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This paper presents the effects on compressive and flexural strength of the interlocking bricks mixed with synthetic polypropylene fibre (SPF) and palm oil fibre (POF). Tests were carried out to compare the relative strength between normal interlocking brick and proposed interlocking brick with fibre. Nine interlocking bricks with various mixture were tested for compression. Three beams specimen were prepared and tested for flexure. The results showed that the addition of fibre has significantly increased the strength of interlocking bricks in all tests. POF interlocking bricks showed the highest strength, while SPF interlocking bricks showed higher in compression but lower in flexural strength than normal interlocking brick. It was concluded that the addition of POF in the interlocking mixture could be used additive mixture to improve the strength of the interlocking brick system.

Keywords: compressive strength: tensile strength: flexural strength: compression test: splitting tensile test: flexural test: synthetic fiber interlocking brick: oil palm fiber interlocking brick.
Behaviour of Composite Beam Arranged as Boxed-Section with C-Channel of Cold-Formed Steel of Lipped Section

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Cold formed steel (CFS) of lipped C-Channel sections are commonly use because of their simple forming procedures and easy to erect. To improve the flexural strength of the proposed composite beam, the C-channel of Lipped section is arranged toe-to-toe to form into boxed shape section and filled with self-compacting concrete (SCC). Reinforcement bars was used in a tension zone to increase the flexural strength of the proposed beam in this experimental study. A U-shape re-bars was installed to act as shear connections between concrete slab and beam of boxed section filled with self-compacting concrete. Two specimens were prepared and tested until failure. A C-channel section of size 250 mm deep, 75 mm width, and 2.4 mm thick was used for the proposed composite beam section. Longitudinal rebar’s size of 16 mm and 20 mm were installed at the bottom of the beam encased by the self-compacting concrete of 50 MPa. A U-shape re-bar if size 12mm in diameter was used as a shear connector and also functioned as vertical shear resistance for the beam system. The beam is kept restrained in position by a profiled metal deckling installed on top of the beam to form a slab system also cast using by SCC. The specimens were tested under pure bending arranged as simply supported beams. It was found that the moment resistance of the experimental results agreed well with the predicted numerical analysis.

Keywords: composite beam, cold formed steel, reinforcement bars, moment resistance, flexural strength

Impact of Corroded Bars and Spalling on the Bond Strength of Reinforced Concrete Structures

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The mechanism of the composite materials in Reinforced Concrete Structure is such that they both have to undergo the same stress and deformation as the surrounding, so as to prevent discontinuity, slip, or separation of both materials. Bond strength results from a combination of several parameters, such as the mutual adhesion between the concrete and steel interfaces and the pressure of the hardened concrete against the steel bar or wire due to the drying shrinkage of the concrete. A total of 24 singly reinforced beams with plain 10mm and 12mm steel rods were cast for this study. The beams were designed to fail by flexure and to allow bond slips occur before ultimate failure. The spalling effect was simulated by debonding the bars along its entire length with PVC pipes thus restricting concrete and steel contact. The beams are then subjected to flexural test by inducing a point load on its mid span. The results of the investigation reveal a slight increase in the bond strength of about 2.68% with the use of already corroded bars and the bond strength decreased by 39.2% and 81.8% for bars that had 25% and 50% of their perimeters debonded. The increase in bond strength with the use of corroded bars can be ascribed to the increased frictional resistance owing to the corroded bars surface roughness. And the loss of bond strength with decrease in contact area was as a result of the bar being unable to resist perpendicular stresses and was easily pushed out of the beam.

Keywords: corrosion; bond strength; spalling; flexure.

Properties of Fly Ash Concrete Containing Tropical Soil Bacteria

Propagation of micro-cracks can lead to the ingress of deleterious materials that can further causing deterioration of concrete and corrosion of steel reinforcement. The autonomous crack healing process using microbiologically induced calcium carbonate precipitation (MICP) is a sustainable alternative to restore the durability of concrete and maintain its serviceability. This paper presents the potential use of tropical soil bacteria as a self-healing agent for fly ash concrete. A solution of 107 cells/mL *Lysinibacillus sphaericus* (*L. sphaericus*), that was used to partially replacing the amount of water was
selected to be the self-healing agent in this study. Concrete cube specimens with 30% of fly ash, were cured under two conditions, which are water and air curing. Fresh and hardened properties of different concrete mixes were evaluated. The potential of the self-healing agent was evaluated in terms of the ultrasonic pulse velocity (UPV), initial surface absorption test (ISAT) and compressive strength. The initial results show that there was an improvement on the compressive strength of concrete and reduction on the surface permeability of concrete through the inclusion of tropical soil bacteria. Compressive strength of fly ash concrete with tropical soil bacteria recorded higher strength compared with fly ash concrete for both curing regimes. This was probably and partly due to the presence of tropical soil bacteria as self-healing agent in the concrete that may react and producing microbial calcium carbonate that fill the concrete pores. Thus, the properties of hardened concrete were enhanced.

Keywords: self-healing concrete, microbial calcium carbonate precipitation

Building Condition Assessment (BCA) on school building in Sabah, Malaysia

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The standard guideline for Building Condition Assessment (BCA) (JKR 21602-0004-13) has been introduced by Public Work Department of Malaysia to manage the government's building in Malaysia especially in Peninsular Malaysia. Whereby, BCA has never been implemented in Public Work Department of Sabah. Since there is so many buildings need to be maintained especially existing school building, it is the right time to introduce a systematic assessment method for managing the maintenance work. Visual inspections for the selected building have been done with reference to Standard guideline for Building Condition Assessment (BCA) (JKR 21602-0004-13) by Public Work Department of Malaysia. Building Condition Assessment online system (BCA-OS) by Universiti Teknologi Malaysia Forensic Centre was used to analyse the existing physical condition of the building in order to determine the rating of the buildings. By using this system, the building will be rated 1 (good) to 5 (critical). Material testing will be conducted to building with rating 3, 4 and 5. This paper will discuss the results obtained from Building Condition Assessment online system (BCA-OS) and test result on 2 blocks of a school in Sabah. In this study it is found that Building Condition Assessment online system are convenient to use and useful to rate the actual physical condition of the existing building. The rating from BCA-OS was found to be really representing the actual condition observed from visual inspection.
Corrosion Study of Pipeline Material for Seabed Sediment in Tropical Climate

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Corrosive environments such as marine sediments can cause corrosion to steel pipelines at any time when certain conditions are met. Seabed sediment could cause severe corrosion damage due to its corrosiveness to the pipelines buried under it. Many consequences could take place in case if there is incident in oil/gas pipelines. Successfully identifying elements of corrosion in marine sediment would enhance the future of steel structure protection and monitoring systems. This article focuses on the behaviour of corrosion rate of steel located near shore environment and the aim is to determine the effect of sediment on corrosion of steel. To investigate that, simulated near shore sediment conditions have been used where the steel coupons buried in sediments which have different characteristics. Weight loss technique has been implemented to determine the weight loss rate of the steel specimens. Based on the results of this study, metal weight loss increases as the duration of exposure to seabed sediment environment become longer. The sea sediment simulated condition has given significant levels of corrosion. Conclusively, the corrosion rate of steel in seabed sediment located in tropical region is complicated and further studies are suggested.

Keywords: pipelines, steel, corrosion, seabed sediment
Optimum comfort factors help in enhancing effective learning process in a classroom. The aim of this research is to study thermal comfort in school classroom for a more desirable learning process. Four schools consist of urban and rural schools in Selangor were selected for this study. Field measurement and questionnaires was used to measure the level of comfort and satisfaction of school teacher and student in classroom. Data was collected using Temperature data-loggers (SD500 Humidity/Temperature Data logger). The questionnaire was analysed based on Likert’s scale rating. Result from both on-field measurement and questionnaire survey suggests that thermal comfort have greater importance to focus. All the schools tested higher temperature than the recommended value. This study also outlines several improvement suggestions actions for better comfort level such as better air ventilation system and smaller class size. Overall, good environment comfort level can lead to positive impact to the user especially for learning environment.

Keywords: thermal comfort, acoustic comfort, visual comfort, school building

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RISBARI: An Alternative House Model for the 2018 Lombok Earthquake Affected People

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Right after the 2018 Lombok earthquake, a huge number of housings were considered to be rebuilt or partially repaired. Out of more than 216,519 damaged houses, around 75,138 houses have to be demolished and rebuilt at the same location. This construction process is required to carry out immediately as majority of affected dwellers are now living at temporary shelters with very limited privacy. A house model made from cold formed steel structure, RISBARI, was proposed. RISBARI was developed to meet two essential criteria: fast erection process and construction budget constraints. A full-scale test of RISBARI was conducted to evaluate its lateral strength capacity. This paper
The perception and Challenges of Construction Stakeholder towards Emissions Reduction in Malaysia

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The increase of global carbon emissions has become an important global issue worldwide including, Malaysia. The construction industry is a large contributor to global emissions despite its efforts of becoming more aligned with sustainability practices. Malaysia has announced a commitment to reduce greenhouse gases (GHG) emissions by delineating the number of measures and targets. However, this commitment has not been greeted with much optimism by all the key players which are believed to be related to the lack of incentives and regulatory procedures to guide into sustainable building construction. In response to this need, this study aims to examine the perception and awareness of construction stakeholder towards emission reduction in construction. Specifically, the research aims to achieve the following objectives: 1) to examine the perception and awareness of construction stakeholder towards emissions reduction in construction, and 2) to identify the challenges that have been faced by construction stakeholder in implementing emissions reduction strategies. In order to achieve the objectives, the questionnaires and interviews have been conducted to 37 construction companies in Selangor. A statistical analysis by using descriptive analysis of relative index and SPSS program is carried out to analyze the data. The findings demonstrate that the majority of the company appear not to monitor emissions in construction site and most of them have a little information about the emissions reduction policy program. The implication of this research lies in providing insight on the strategies and challenges that have been faced by construction stakeholder towards emissions reduction which will help the policy maker in developing an efficient policy, guidelines and regulatory framework of construction emissions reduction schemes.

Keywords: challenges, construction stakeholder, emissions reduction, strategies

Investigating the utilization of coal fly ash in the adsorptive removal of fluoride from contaminated water

The utilization of coal fly ash in the adsorptive removal of fluoride from contaminated water

summarizes the earthquake-resistant RISBARI house as well as the planning of its implementation in massive production through 5Ms principles.

Keywords: Cold formed steel structures, prefab houses, RISBARI, the 2018 Lombok earthquake
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75% of the global production of fly ash (FA) totalling 562 million metric tonnes becomes solid waste causing major environmental and economic havoc. In this research, a comparative study was conducted on the utilization of raw and chemically modified FA adsorbents in the removal of F− from contaminated water. The modification was done by using HCl and MgCl2. Characterization of the adsorbents was done by using SEM-EDX analysis, specific surface area (SS) and pH of zero-point charge (pHzpc). The characterisation confirmed that the modification process removed the impurities in FA and improved the SS. However, the shift of pHzpc from 10.71 to 4.94 was unfavourable for the F− removal due to the reduction in the pH range in which the adsorbents surface charge is positive. Adsorption studies indicated that raw adsorbent is more effective than the modified adsorbent. The maximum adsorption capacity obtained at the optimum conditions (pH = 2; contact time = 120 minutes; dosage = 2.0 g/L) was 3.64 mg/g and at neutral pH it was 1.0 mg/g. In conclusion, raw FA adsorbent can be used as a low-cost adsorbent material to remove F− from contaminated water.

Keywords: adsorption; fly ash; fluoride; chemical modification

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The Quality Assessment System in Construction (QLASSIC) developed by CIDB to measure and evaluate the quality of workmanship and finishes of construction works. Unfortunately, QLASSIC is not fully implemented and applied by all contractors in Malaysia as this element is not a compulsory requirement in getting projects. This paper presents the findings of determination on the understanding of contractors towards the implementation of Quality Assessment System in construction (QLASSIC) in construction industry. This objective was achieved based on the literature review and questionnaire survey. The respondents were selected based on the grade of contractor from G5 to G7 construction companies in Klang Valley. Sample of questionnaire would be 200 and the reply from respondents responded is 95. The data was analysed using Reliability Analysis and Descriptive Analysis. The results
indicate that the understanding of contractors is only basic understanding on QLASSIC system but the detail implementation of QLASSIC from contractors were still low. On further research, it may able to study on the implementation of QLASSIC in client’s perspective. The research will study on the implementation of QLASSIC but in the others perspective which is look into the understanding of QLASSIC to clients, the challenges and benefit from QLASSIC implementation.

Keywords: Qlassic, Construction, Contractor, Quality

Performance of Concrete Incorporating High Volume Coal Waste

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The rapid growth in the construction industry has increase in the consumption of raw materials whereby it depletes the natural resources. Therefore, the need of abundant and cheap materials is increased. Also, coal waste is abundantly available from coal generating power plan. The aim of this research is to investigate the performance of concrete incorporating high volume coal waste as cement and aggregates replacement. The specimens are prepared by using 30% coal fly ash as cement replacement and fully replacement of aggregates with coal bottom ash. The specimens are cast using 100 mm x 100 mm x 100 mm cubes. There are several tests conducted in this study for example, the test for characteristic of the materials, fresh and hardened properties of concrete. It was found that the workability of concrete decreases with the inclusion of coal waste. Overall, it is found out that the coal waste can be used as aggregates replacement in concrete since it has a comparable strength with a conventional concrete.

Keywords: coal waste; aggregates replacement; concrete; coal bottom ash, compressive strength

Project Manager's Skills Framework (PMSF) for improving the performance of complex projects in Kuwait Construction Industry

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The purpose of this study is to evaluate the skills and competencies required by project managers in successfully completing a construction project. There are several critical success factors that are proposed in the literature. However, the role of project manager is one of the crucial factors in achieving project success. Project managers handling large and complex construction projects have to deal with several factors to ensure coordination in achieving project delivery based on time, cost, and quality. The aim of this study is to identify the project manager’s skills framework (PMSF) that are required in improving complex construction projects in Kuwait. The construction industry has a key role in the economic growth of the country. Construction projects could be recognized as simple projects, organizationally complex, complex in technical way and projects that are recognized as critical accomplished mission. There are several studies in this area and there the topic receives more academic attention due to the complexity of the project. Construction projects that are recognized as technically complex could be recognized in several forms, such as when using a new technology that are not understandable by the project members. Project manager's skills have a direct impact on the performance of the construction projects and therefore on the project's success. Use of appropriate skills in managing the different types of projects contribute to improving the performance of construction projects. Project managers skills in the management of the project such as teamwork, effective communication with staff and contractors, and effective resource management, effective planning and training, risk management are some of the important factor that have been identified from literature and through empirical research as essential for successful project outcomes. The empirical data for this study will be collected through survey and interviews. The target population for this research will be project managers who are involved with complex construction projects in Kuwait. Kuwait has several large and complex projects that are currently in various phases. Many of these projects are facing several delays. The findings of this research will contribute to exiting literature on developing a project managers skills framework (PMSF) that can be used by academic professional, business practitioners, and policy makers in identifying the issues facing construction projects and providing successful outcomes.

Keywords: Construction, Project Management, Project Success, Skills, Kuwait.
In any beach nourishment project, the estimate of the depth of closure is the most important aspect and it can be done with the data of periodical beach profile surveys. In this paper, beach profile survey data of four years 2003 (before nourishment), 2005-2007 (after nourishment) and 11 profile chainages were analyzed to measure the depth of closure using the fixed depth change criteria at Teluk Cempedak, Kuantan. The results from the measured closure depth were then compared to that calculated from the Hallermeiers’ equations. The effective wave height was calculated using a wave refraction model that was developed and analyzed against offshore wave heights to predict the on-shore wave heights at a depth of 10 m using Delft3D model. In comparison, the predictive equation showed an underestimate of the average closure depth of approximately 5% which contradicts with the previous finding. However, this underprediction could be due to the depth of closure captured at the mid-zone for the chainage profiles that are located near the southern headland. Neglecting these chainage profiles lead to an over-prediction of the closure depth based on the Hallermiers equation that the predictive equation determines an upper limit value of the depth of closure. The depth of closure for the studied area is within the limitation of the beach profile data and can be equated to 0.8 times $Hs^{0.137}$. The predictive equation is only applicable to beaches where the wave climate condition is similar to that studied area.

Keywords: closure depth, predictive closure depth, wave modelling, beach nourishment, Teluk Cempedak

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**Conceptual Framework on Noise Ranking Classification in Eatery Places for Human Psycho-Acoustics Preferences and Design Strategy towards Acoustic Comfort**

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One of the important dining interests for focusing on smelling and tasting during dining in eatery places is having concentration or attention perceived of what we eat or drink. The dining satisfaction influenced positive behavior of return intent and recommending the eatery places to others. Higher noise level may distract the concentration for having a fine dining experience and could interrupt the ability of smelling and tasting senses. Settings in the noisy atmosphere of eatery places such as located near to a busy road, open kitchen, table layout and inappropriate decoration as well as the patrons’ conversation behavior may affect speech intelligibility. It is also have direct significant impact to human preferences on acoustic comfort during their dining. However, there is no specific classification or rating system...
established in Malaysia to assist the information on acoustic environment obtained in the eatery place. The aim of this paper is to identify the framework of eatery places classification in Malaysia within the context of the acoustic comfort and its performance. The main concern is to elucidate clearly different categorization of eatery places which might have significant on human psycho-acoustics. Based on ongoing research, this paper will discuss on the critical literature reviews to develop a conceptual framework in classifying eatery places design strategy and acoustic preferences.

Keywords: eatery places, acoustic comfort

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**Numerical Investigation of Coastal Sediment Transport for Assessment of Coastal Erosion of a Philippine Coastline Using a 3D Hydrodynamic Model**

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The Philippines, being an archipelagic country with at least 36,000 km of coastline, has been identified to have more than 20 areas that are at risk of coastal erosion. One of these areas, located in Ibaajay, Aklan, was studied wherein a 3-dimensional numerical model using Delft3D was created in order to simulate and analyze the prevailing hydrodynamics and sediment transport. The model was calibrated using continuous water level and velocity data obtained from sensors deployed during two separate field surveys. Model results showed excellent agreement with observed data and sufficiently captures the existing tidally dominated hydrodynamics of the study area. The temporal variability of the hydrodynamics and transport of sediments was investigated by simulating flows during flood-ebb, spring-neap, southwest-northeast monsoon, and 2-year long conditions. Areas of erosion and deposition were identified based on the results of the long-term simulation. None of these areas were located along the coastline except on the area near the stream where local erosion and deposition happens. Based on this, it can be concluded that the study coast is stable under prevailing tidal conditions. The obtained results can be used as baseline data for managing future coastal developments of the municipality and the methodology conducted in this research can be applied on other erosion-prone coastlines nationwide.

Keywords: Coastal hydrodynamics, Coastal sediment transport, Coastal erosion, Delft3D
On the Corruption in Public Infrastructure Procurement in Indonesia - A Literature Review

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The Public Information Openness written in Law 14:2008 opens access to the Government to realize the implementation of the State to be good and to create good governance. The implementation of a good State is one of the benefits of preventing corruption, meaning that Indonesia's funds and natural resources are fully managed for the interests and prosperity of the people. The public understands corruption as something that is detrimental to state finances. In Law 31: 1999 in conjunction with Law 20: 2001 concerning Eradication of Corruption Crime there are 30 types of corruption. One of the seven Corruption Crime groups is gratification. Gratification is all gifts received by the State Execution in accordance with applicable provisions according to the Eradication Law Corruption Crime. Two of the seven principles of gratification control are transparency and accountability. The principle of openness is reflected in the mechanism for reporting on receipt of gratuities to the Corruption Eradication Commission. This study attempts to identify various aspects associated with potential occurrence of corruption in the procurement of Government sector infrastructure projects based on literature review through existing legislation in Indonesia. The results of the study are expected to be able to find indicators as potential corruption in infrastructure procurement.

Keywords: Corruption, Infrastructure, Gratification, Transparency

Effectiveness of Crumb Rubber for Subgrade Soil Stabilization

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The properties of subgrade soil are important in the pavement design as its main function is to support the load transmitted from overlying pavement layers. Subgrade must have sufficient strength and
stability even under bad traffic and climate conditions. Soil with good qualities should be used as subgrade but not all soil possesses the required abilities as there are some locations that have poor qualities of in-situ soil. The stabilization of soil can be used to improve the poor subgrade; hence it may reduce the thickness of pavement design and also increase life of the pavement. In this study, soil stabilization using crumb rubber is the alteration of subgrade soil as the properties of crumb rubber are lightweight and high shear strength. Moreover, it can also reduce the improper tyre’s disposal problem and pollutants. The soil used are collected from a landslide site located near to Mengkuang Dam in Seberang Perai Tengah, Penang in order to investigate the performance of subgrade soil stabilized with 2%, 4%, 6% and 8% of Crumb Rubber (CR). A series of laboratory testing of unsoaked and soaked (4 days) California Bearing Ratio (CBR) test have been performed to evaluate the best percentage of CR which fulfilled the JKR specification for subgrade. The results show that all mixtures; M2 (2% CR), M3 (4% CR), M4 (6% CR), and M5 (8% CR) are fulfilled the subgrade requirement according to the Public Works Department Malaysia (JKR) standard specification for road works where the CBR value must achieve more than 5%. The mixture with 4% CR (M3) shows the highest unsoaked and soaked CBR values, thus, the 4% CR is recommended to be implemented for subgrade soil stabilization.

Keywords: California Bearing Ratio (CBR), Crumb Rubber (CR), soil stabilization, subgrade

An evaluation of public university assets as revenue initiatives

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Public University (PU) in Malaysia faced uphill challenges to formulate strategies and implementation plan for financial sustainability. As the Malaysian Government has given the PUs partial financial autonomy with quite a substantial budget cut started from 2016. One of important resources for revenue initiatives is through monetisation of physical assets. The decision made by the government to encourage PU to seek their own funding not only in research, even for operating expenditure. This scenario hurts the operating activities such as asset operation and maintenance. The effort by the PU is to ensure the financial sustainability of university besides focussing on the core business of PU viz. teaching and learning, research and innovation; and community engagement. With a limited budget, full utilisation of assets in a university such as student accommodation, multi-purpose buildings, sport and recreational facilities and the land could be resources to generate the revenue. Thus, this paper highlights the type of asset PU that has the potential to be monetised and at the same time not sacrificing the main functions of the assets for the purpose of a higher learning institution. An evaluation of potential assets for income generation was undertaken to ensure appropriate assets for this purpose. Universiti Teknologi Malaysia (UTM) was selected as a case study. The assets of UTM were identified, categorized and analysed using a SWOT analysis. Results from this study found that asset of UTM is
divided into two categories namely core and non-core asset. The core asset consists of an academic building, supporting centre, library, research centre and laboratories. On the other hand, administration building, hostels, sport centre, arcade and land are some of the non-core assets. In the context of revenue initiatives, the non-core assets have a high market value because it has a unique selling point. At the end of this study, the propositions of project implementation were based on quick win, medium term, long term and high impact projects.

Keywords: Revenue initiatives, Public University, Asset Management

Mapping of construction waste for eco-costs per value ratio (EVR) index using Google My Maps in Shah Alam, Malaysia

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Construction waste is one of the major factor faces in our world today. Industry in Malaysia such as residential, commercial and infrastructure are identified as rapid growing field, which indirectly brings economy growth to our country. The waste generation in construction industry is increasing proportionally with new construction development. This leads to negative impact to environment. This study focuses on a mapping of construction waste generation for low-rise residential in Shah Alam district, Selangor using Google My Maps system. Information of the construction waste generation data such as coordinate, photos, types of materials, type of waste, quantity of waste, gross floor area, labour cost, material life-span and EVR index for monitoring gathered manually through case study and site observation for 14 months of contract period. The collected data assigned to Google My Maps and Appsheet for mapping process. The result and finding of this analysis based on 5 sample selected sites in Shah Alam which constructed within year 2013 to 2017. The result identified total of 9 type of construction waste such as rebar and BRC, concrete grade 25, timber formwork, bricks, plaster cement, tiles, drywall, metal deck roofing and ceiling. These wastes were accounted to vary amount of EVR index between projects during contract period. This system will assist to monitor on total construction waste generated from beginning stage of a project and create potential outcomes of decreasing the construction waste by in development towards sustainable construction.

Keywords: Construction Waste, Sustainable Construction, EVR, Mapping, Google My Maps

A Situational Study on Sustainable Housing Features in Johor

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Sustainable housing brings an innovation in Malaysia housing industry scene. The trend has witnessed a surge in the demand for this offering by house buyers which in return has encouraged housing developers to incorporate its features in their products. The features offered by the housing developers varies while customers are encouraged by the noble causes that their purchased will make. As demand for the products increase, errant and irresponsible developers are unreasonably taking the advantage by charging exorbitantly for the product that they market. In this instance, the words “Eco” and “Green” have been used as the gimmick for marketing purposes while there are no evidences that show whether the features have been truly incorporated in the housing products sold to the customers. The situation thus called for a situational study to be carried out, which aim to clarify the situation happening in the housing industry. Accordingly, the objectives of the study are: (1) To identify the sustainable housing features provided by developers to the buyers; and (2) To identify the house occupant’s satisfaction with the sustainable features available to them. The research is an exploratory research which seeks to provide data in respond to the situation facing the industry. Therefore, both quantitative and qualitative research strategies will be employed by way of a checklist together with a satisfaction survey focusing on housing projects in Johor. Data for the study will be analyzed by employing descriptive analysis as well as thematic coding analysis. A comprehensive discussion will be offered as the possible outcome of the study. This includes the contentment of house buyers towards the sustainable features that are offered by housing developer and how it can be classified as sustainable housing in virtue of the three pillars of sustainable development.

Keywords: Sustainable Housing, Sustainable Features
specifically on Jakarta in Indonesia. The questionnaire was developed and distributed by 144 questionnaires to the construction stakeholder. The researchers used the simple regression and stepwise analysis to measure the effect of Green Behavior Capability on Green Construction Performance, and Environmental Orientation Optimization as a Moderate Variable. The most important finding of the study is having impact of green behavior capability in green construction performance, and also there is impact of the environmental orientation optimization as a moderator variable between green behavior capability and green construction performance. This study confirms the presence impact of green behavior capability in green construction performance, and this confirms that the practices of green behavior capability and environmental orientation optimization have significant benefits at the level of the authority policy and achieve significant savings at the level of the Construction Industry.

Keywords: Green Behavior, Green Performance, Environmental Orientation, Green Construction

Green Construction Capability for Environmental Sustainability Performance: An Empirical Study on Construction Sector in Indonesia

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The purpose of this paper is to find out the relationship between green performance capability (GPC) and environmental quality (EQ). Presently, many EQ issues have impact on green construction, e.g., waste reduction and ecology. In business world, there is a positive trend among construction sector to start reporting over green performance capability keeping their role as environmental quality alive. – Self-administered questionnaires were floated to gather data from employees of construction industry. In order to analysis the collected data, regression analysis and correlation coefficient were employed to check hypotheses. Statistical Package of Social Sciences has been used for data analysis. Results reveal that there is a direct positive relationship between GPC and EQ. The three aspect of GPC, i.e., material, machine and labour also have significant association with EQ. EQ carries with itself sensational openings for the construction management role and with the opportunity originates responsibility. This study emphasizes the revised planning of risk and causes root to create awareness among employees and strategies to improve EQ and green performance level of companies in competitive world. This research carries a new horizon to explore the association of GPC with EQ in construction sector. The study presents first-ever empirical evidence about the relationship between EQ and GPC from developing countries.

Keywords: Green Construction Capability, Environmental Sustainability, Green Construction, Indonesia
The accident occurrence in the construction industry is reportedly the third-highest after manufacturing and agriculture industry. The percentage of accident cases and fatality ratios in the Malaysian construction industry are getting larger and gradually increasing each year. This data indicates that the safety and health performance in the Malaysian construction industry appears to be weak. Henceforth, the Department of Occupational Safety and Health Malaysia (DOSH) through government initiative has introduced and published a guideline on Occupational Safety and Health in Construction Industry (Management) 2017. This guideline aims to decrease 50% of the fatality rates in the construction industry by 2020. Therefore, this paper sought to review the current OSHCIM practice in Malaysia construction industry towards the OSHCIM implementation. This study adopted a quantitative approach in conducting the data collection and the data analysis process. A set of questionnaire was developed, tested and distributed to the construction stakeholders i.e. client, designer, safety and health officer, contractor, enforcer, etc. The results were discovered that the OSHCIM concept already being “Practice” by the construction stakeholders in Malaysia in terms of the (1) management, and (2) standard operating procedure elements. Thus, this study shows that the construction stakeholders were currently practising the OSHCIM concept but with different procedure and approach. In conclusion, the implementation of OSHCIM in Malaysia construction industry is foreseen to be well accepted as most of the stakeholders are familiar with the concept of design for safety.

Keywords: OSHCIM, Design for Safety, Practice
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Construction industry is a section of economic activity that is unique where it involves many parties with certain objectives, cost range, and has a target on completion of the project. Accidents on construction sites often involve injury, death, damage to machinery, construction materials and others. From the year 2012 until 2016 the number of fatality cases at construction site keeps growing. The high incidents number of injuries in the construction industry and the higher fatality rates amongst the construction-related workers are generally due to the nature of the work and a variety of hazards involves. However, expositions to only hazard identifications seems to be unsatisfactory since most of it indicates that the levels are far from ideal. Early intervention, hazards can be more effectively eliminated or controlled leading to safer worksites and construction processes. The Safety by design (SbD) is a process that identify hazard and assess risk early in the project design stage, instead of the conventional way which is during the construction stage. However, a study in Spain shows that there is still a lack of emphasis on the SbD concept in higher education although the concept had been implemented for a long time in the country. The lack of tertiary education regarding SbD can easily lead to insufficient knowledge for the effective implementation of SbD by future professionals. Although the concept of SbD can help improve the safety and health performances in the construction site, many injuries still occur because it is poorly implemented by engineers and architects. As for the construction industry of Malaysia, the safety by design concept will be soon implemented as the Guidelines on Occupational Safety and Health in Construction Industry (Management) – OSHCIM established by the Department of Occupational Safety and Health Malaysia (DOSH) recently. Therefore, this paper sought to review the perception of academician regarding OSHCIM implementation. In this research, quantitative strategy will be adopted for data collection purposes. A set of questionnaires will be carried out with academicians who are involved in educating architecture, civil engineering, quantity surveying, mechanical engineering and electrical engineering courses in Malaysia’s Institute of Higher Learning Education. The research indicates that most of the academicians tend to agree that sufficient knowledge and the right attitude is essential for the successful implementation of SbD design education in university. It seems that all academicians from all different background have higher attitude mean score compared to their knowledge mean score. This indicates that although some of the academician might not be too familiar about what SbD is since it was a relatively new concept in the Malaysia’s construction industry, most of the academician were not against it and they have a positive and right attitude towards it.

Keywords: OSHCIM; Safety by design (SbD); Higher education
Risk Factors Associated with the Outsourcing of Urban Facilities Management

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Outsourcing strategy has been adopted by Malaysian local authorities in managing urban facilities. However, risk factors associated with outsourcing may bring adverse impact to the efficiency and effectiveness of urban facilities management. It is therefore important to gain insight into outsourcing risk factors. This study aims to identify the risk factors and to recognize the critical risk factors associated with the outsourcing strategy for urban facilities management. As a quantitative study, a set of questionnaire form was distributed among the officers involved in urban facilities management from Johor Bahru City Council and Iskandar Puteri City Council. Two types of analyses were adopted; Descriptive and Relative Importance Index (RII). The results discovered a plethora of critical risk factors associated with the outsourcing practice for urban facilities management in Malaysia, that include the inadequate definition of the scope of services, absence of a benchmark to evaluate the quality of services, insufficient budget allocation for outsourcing and lack of monitoring on appointed private companies. The outcome of the study, therefore, provides a better understanding of risk factors that may cause outsourcing failure during the management of urban facilities.

Keywords: Urban facilities management, outsourcing, risk factors, built environment

Obstacles of revenue diversification in public higher education institution

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Great planning is about taking into account all aspects that will influence the organization in the future. In the context of higher education institutions, the shrinking budget from the government has affected the university strategic planning which involves all parties such as students and staffs. The budget constraint has restricted some of the student's activities and the staff’s development. As a solution, a university must re-draw the financial ecosystem of the university. In this paper, the authors highlight about factors need to be considered to reengineering their financial ecosystem. Universiti Teknologi Malaysia (UTM) has been selected for a case study. This study aims to investigate about the fixed asset utilization as current strategy for revenue initiatives in UTM. The investigation covers three tiers of management; strategic, tactical and operational. Interview sessions with non-academic staffs, series of the workshop as well as observation were conducted. In this paper, the authors will elaborate on the function of 4P’s of marketing with the current issues of asset management in UTM is elaborated. This study has found several issues such as financial management, vague policy and standard operating procedure and lack of expertise in marketing. Therefore, the management of the university has to work closely with the 4P’s of marketing; price, people, place and product. The asset of the university such as lands, buildings and arcades were utilized to generate the university income. The student’s accommodation, equine park, recreational forest, hotel and dialysis centre are examples of asset that is belong to the university and also the source of income to UTM. However, the management of the university’s asset faced difficulties to maintain as well as to achieve the target sales every year.

Keywords: asset university, income generation, asset management, marketing

Green Buildings: A Hype?

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There is a general consensus that green buildings have better building performance compared to conventional buildings. Whilst previous research have established the benefits of green buildings, it has been argued that this benefit might have been over exaggerated due to the evidence of dissatisfaction in green buildings performance. Thus, this calls for a research on occupants satisfaction on green building’s performance. An observation performed on ZEO building occupants indicated that the building occupants were moderately unsatisfied with the building’s performance. This research adds to the growing body of literature and contributes to the understanding of academia and practitioners on green buildings in constructing both.

Keywords: Green Office Buildings; Satisfaction; Post-Occupancy Evaluation
Challenges of implementing green procurement in public construction projects in Malaysia

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Although the concept of green procurement is increasingly debated as environmental policy instrument that considers the impact of procurement as well as the purchasing process for the sustainability of project development. However, the concept in Malaysia is still in its infancy and facing various barriers and challenges to make a paradigm shift towards greener approach. Therefore, this paper tends to determine the challenges that hinder the green procurement implementation. In addition, this study aims to develop a roadmap for implementing green procurement in building and infrastructure projects. This could pave the road to establish a transformation plan that could gradually overcome the current challenges in order to reach to the holistic level. The study is based on a survey conducted in Malaysian organizations at which 100 organizations were surveyed to determine their perspective on 40 pre-determined challenges. A number of 89 questionnaires were returned and 76 were valid responses. Results revealed that an excellent consistency on the significance of the current challenges. These are mainly due to the higher upfront cost associated with eco-products and services, gap existence between policy formulation and actual project delivery, lack of legislation to introduce mandatory influence for green adoption.

Keywords: green procurement, challenges, Malaysia

The Properties of Self-Compacting Concrete Using Fly Ash from Hongsa Power Plant

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This paper presents the investigation of properties of fresh and hardened concrete which combines of two cementitious materials, Ordinary Portland Cement (OPC) and Fly Ash (FA) from Hongsa Power Plant. The mixed proportion of concrete has been designed for 0.38 of water-binder ratio (w/p) and the replacement ratio of FA to OPC is 5% to 40% by mass which steps every 5% of FA. The total binders in the mixed proportion is 445kg/m$^3$. The water reducing admixture which is Modified poly carboxylate type was used. The slump flow, T500, V-funnel and L-box were tested for investigation of the properties of fresh concrete. Then, compressive strength and tensile strength of concrete at 28 days of age were carried out for examining the hardened concrete properties. The results of study show that using cement combining with fly ash from Hongsa Power Plant improved the rheology of fresh concrete and the hardened concrete properties also have been improved dramatically.

Keywords: binders, Fly ash, cement, self-compacting concrete, fresh concrete, hardened concrete

Perceptions of Potential Home Buyers on Smart Home Concept

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The concept of smart home is a rising trend within the housing industry in Malaysia. With the advance of technology, homeowners are able to control and monitor their home through the smartphone or other networked device. However, it was discovered that Malaysians are highly reluctant in adopting smart home concept and similar Internet of Things (IoT). Within the smart home market, there were cases where potential home buyer may be unaware of the technology, thus hinder its adoption and further development. This research aims to investigate the awareness of homebuyers on smart home concept; perception on the factors influencing them to buy and key features that they will consider in buying a smart home. Questionnaire survey has been conducted and descriptive analysis has been used to analyse the data. Findings showed that the knowledge on smart home concept is still low among the potential home buyers. Respondents with the intention to buy smart home has chosen ‘saving energy, time and money’ as the main factor influencing while ‘wireless lighting system’ as the key features that taken into consideration. These findings may encourage the adoption of the smart home concept among the potential home buyers in Malaysia and therefore intensify its development in the future.

Keywords: Smart home, potential home buyers, perception

Process of Construction Procurement in Industrialised Building System

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The government, through CIDB Malaysia have continuously promoting Industrialised Building System (IBS) to increase the immense efficiency of the building performance structure. However, the level of IBS adoption among the construction players in Malaysia is still low and far from the government expectation. It is evident that most of the IBS projects developments in Malaysia are still conducted by using the conventional procurement method. This creates a number of issues such as reworks, time delay, rising cost, lack of communication and integration problem. Thus, this paper will identify existing procurement process used for IBS projects in Malaysia construction industry. Identifying existing procurement process helps in providing significant elements before creation of a more effective new procurement for IBS projects in Malaysia. Expert interviews was used, whereby 5 (five) interviews sessions were conducted with IBS experts in Malaysia construction industry. Thematic analysis was utilised to analyse the interview result by identifying the existing procurement process adopted in current IBS projects. Findings from expert interviews showed that there are three different procurement process commonly applied in current IBS projects. Result also shown that one of the significant barriers to IBS adoption is the current practice of procurement and team integration. Therefore, a more effective new procurement for IBS projects should be considered and pursued urgently in order to improve IBS implementation in the Malaysian construction industry.

Keywords: IBS, procurement process, integration, Malaysia Construction Industry

Rubber Damping System of Industrialised Building System (IBS) Block Work House

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The block work house with Industrialised Building System (IBS) is innovated to minimize the rate of casualties from earthquake disaster. In order to improve the ductility of IBS block work house, rubber dampers are used to resist dynamic motion of a structure under seismic event. Through the research, the seismic performance of the scaled 1:5 IBS block work house column was obtained. The objective of
A Study on Integration of Building Information Modeling (BIM) in Civil Engineering Curricular

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Building Information Modeling (BIM) is an effective approach that can manage the construction projects life cycle activities and being used by the architecture, engineering and construction (AEC) to ensure the good quality of the projects, reduce cost and facilitate communication among contractor players. The development of the BIM uses in construction industry has widely spread in many countries, unfortunately not in Malaysia even though it was started in Malaysia since 2004. Several universities worldwide offer BIM courses in their program, while many others are under the process of integrating BIM into their curricula. As a matter of fact, most of the universities lack realization of the importance of BIM application, BIM teaching strategy, and plans to overcome the barriers to integration of BIM into curriculum. This paper presents the current state of BIM education in the engineering program in Faculty of Civil Engineering (FCE) as case study. A detailed literature review and questionnaire survey was performed for this purpose followed by statistical analysis. The research presented the status of BIM education in FCE and formulated a framework that will provide guidelines for those universities which are not currently implementing BIM or just started developing BIM curriculum. More realistic project-based class assignments that supported students with learning how to apply different formal project management methods to real-world project management problems will be adapt. The program in the universities will be able to produce graduates who are equipped with the necessary knowledge and skills of the modern tools such as BIM before they enter into their professional career.
Drivers travel at speed they judge to be comfortably achievable in relation to the prevailing conditions and road geometry. The relationship between road geometrical design and speed of travelling vehicle is very prominent. Speed varies according to the perception of constrain imparted to the drivers by the road geometrical design. The purpose of this study is to investigate the relationship between design speeds, operating speeds, and speed limits while drivers negotiate the horizontal curve. Furthermore, it investigates the behaviour of driver manoeuvre on the horizontal curve under mesopic and photopic visions. The study was carried out by analysing the speed characteristics during daytime at three different segments along the horizontal curve (i.e. transition at entering of curve, middle of curve, and transition at leaving of curve). It discovered that vehicles travelling on transition entering the curve tend to travel at higher speed than on the middle of curve and on transition leaving the curve. Based on the preliminary finding, further testing on middle of curve at night time was carried out to find significant effect under mesopic and photopic visual conditions. The speed data measurement was based on spot speed data at specific points and locations using the laser gun detector. The research also found that the existing speed limit of the selected road stretches was lower than the 85th percentile speed. The 85th percentile speed is a commonly used measure to decide the speed limit on a road. Apart from that, the difference in the mean speed on the contrast sensitivity under mesopic and photopic conditions was determined via t-test. Further discussion on the analysis is presented in the data and result analysis section.

Keywords: Speed, Road Geometrical Design, Road Safety, Curve Road, Mesopic, Photopic
The benefits of implementation of BIM technologies and tools in significantly construction wastes in the Malaysia construction Industry

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Malaysia, as a rapid developing nation with a ballooning construction industry, has fallen victim to a predicament that has affected most similar developing nations, which is the mass outflow of construction wastes. The expeditious advancements made by this sector couple with an all-time high demand of a list of development projects ranging from infrastructure to residential and commercial centres, has led to the production of large amounts of construction wastes which is made exponentially worse by the emplacement of flawed, inconsistent and insufficient practices in dealing with the ever-expanding rates of construction wastes. As a potential solution in mitigating this problem, Malaysia has been looking at the introduction of BIM tools and technologies, as an industry norm, to all construction practices and stages. However, the proper and systematic assimilation of the BIM systems in Malaysia has not proven to be entirely possible yet, particularly in a scale that would be significant enough where it could sufficiently be utilised in the reduction of construction wastes. This limitation, can be attributed to many factors such as the perceptions and acceptance of industry players to learn and adapt to this relatively new software, reluctance in replacing the conventional methods, which the industry players are all too complacent with, of waste managements that have been in-place for decades, coupled with an incomprehension of the myriad of benefits such an implementation could bring about to the local construction industry, as exemplified by many other developing nations that have jumped on the bandwagon of incorporation of BIM into their practices for years now.

Keywords: BIM tools and technologies, construction waste, and benefits BIM

Factors Affecting the Delay in Construction at Mentawai Island, Indonesia

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Currently the construction sector became the backbone of the Indonesian economy with infrastructure development being intensified in Indonesia. Construction of infrastructure projects and construction projects is generally overshadowed by project delays. The geographical position of the Mentawai Islands separated from the main island has a potential for project delays. This paper presents research on the factors causing project delays in the Mentawai Islands. The study was based on survey methods using questionnaires to stakeholders in construction projects in the Mentawai Islands. Of 77 respondents found that the main factors causing delays are weather problems, lack of manpower and incomplete planning documents.

Keywords: construction projects, project delays, Mentawai island, stakeholders, questionnaires, respondents
Classroom illuminance: a case in Malaysian university

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Lighting is an important requirement for human to support their daily activities. Building users in Malaysia rely on artificial lights in the building. However, improper use of artificial light in the room will lead to negative impacts on the occupants’ health, comfort and productivity. This study investigates the light level of the classroom in university. A total of 61 samples were collected and compared to Malaysian Standard 1525:2007, the illuminance for the classroom. The observation was conducted in two sessions a day using lux meter. The results showed that 62% of the classrooms have good illuminance, which complies to the existing requirement of illuminance in the classroom in Malaysia, within the range of 300-500lx. The findings of this study provide an overview of the existing illuminance in the classroom in university and serve as a basis of reference to the management in its efforts to improve the indoor environment quality and the student’s well-being.

Keywords: Illuminance, classroom, indoor environment quality

The Effects of Seaweed Powder to the Properties of Polymer Modified Concrete

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Gracilari Sp. is a sea plant that commonly known as seaweed grows abundantly throughout the world agricultural industries. The effects of alginate from seaweed benefited the properties of composites due
to its advantage as a hydrophilic gelling material. This paper investigates the effects of Gracilaria Sp. (seaweed powder) in polymer modified concrete. The investigations covers on the physical properties and mechanical properties of the polymer modified concrete based on different percentages of seaweed powder. The percentages chosen are 10%, 20%, 30%, 40% and 50% cement replacement inside polymer modified concrete. The effects on the seaweed powder percentage to the properties of polymer modified concrete are determined through elemental composition, water absorption, pulse velocity, compressive strength and indirect tensile strength. Findings from the experimental works show that an optimum seaweed powder percentage into polymer modified concrete is 20% with improvement shows from all the investigated properties. It can be concluded that, seaweed powder potentially acted as a binder in polymer modified concrete and potentially choose as a sustainable material inside polymer modified concrete.

Keywords: seaweed; seaweed powder; polymer modified concrete

Review On The Application Of Optical Fibre Sensing In Slope Monitoring
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The catastrophic event of slope failure which leads to the destruction of surrounding facilities and the loss of public lives has been acknowledge to be one of the most discussed topics in geotechnical engineering. Many conventional and modern techniques have been developed by researchers throughout the years to come out with a technique that is effective in monitoring slope deformation and thus, control the damage that may be caused by slope failure. Recently, the application of optical fibre sensing (OFS) has gained wide attention among researchers in slope monitoring application. It is known that OFS carries many advantages in terms of high resistivity towards electromagnetic interference, wide sensing range, and easy installation. This paper presents the overview of the recent development and application of distributed optical fibre sensing (DOFS) in slope deformation monitoring. Two main types of DOFS namely Brillouin Optical Time Domain Reflectometry (BOTDR) and Brillouin Optical Time Domain Analysis (BOTDA) are discussed in detail of their basic principles and applications focused on slope deformation monitoring.

Keywords: distributed optical fibre sensing, fibre bragg grating, slope failure

Effects of crumbed para rubber on permanent deformation resistance of hot mix asphalt
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This paper presents the effects of crumbed para rubber which is added into a portion of aggregate in hot mix asphalt (HMA) during the batch mixing process or called “Dry Process”. The dry process has an advantage on its simplicity of quality inspection and less modification in the hot mix plant production process. This study has investigated the effects of adding crumbed para rubber particles on the engineering properties related to permanent deformation resistance of asphalt concrete. In this study, the asphalt mixture is prepared via Marshall Mix design, which contained with limestone and asphalt cement of Pen 60/70 at 5.4% by total weight. Crumbed para rubber at 2% by total volume was added in asphalt mixture via two methods, dispersive mixing method and layer method. The specimens that prepared from each method were compacted to cylinder shape according to the requirement of testing standard using Gyratory compactor. The specimens were tested to find resilient modulus according to ASTM D 4123-82 and dynamic creep test according to AS 2891.12.1_1995. The results showed that adding crumbed para rubber in aggregate by dispersive mixing method is the most effective method. It has increased significantly the resistance to permanent deformation compared with the conventional mixture.

Keywords: crumbed para rubber, hot mix asphalt (HMA)